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PROPELLANT SURVEILLANCE REPORT. LGM-30F, STAGE II, ANB-3066,(U)
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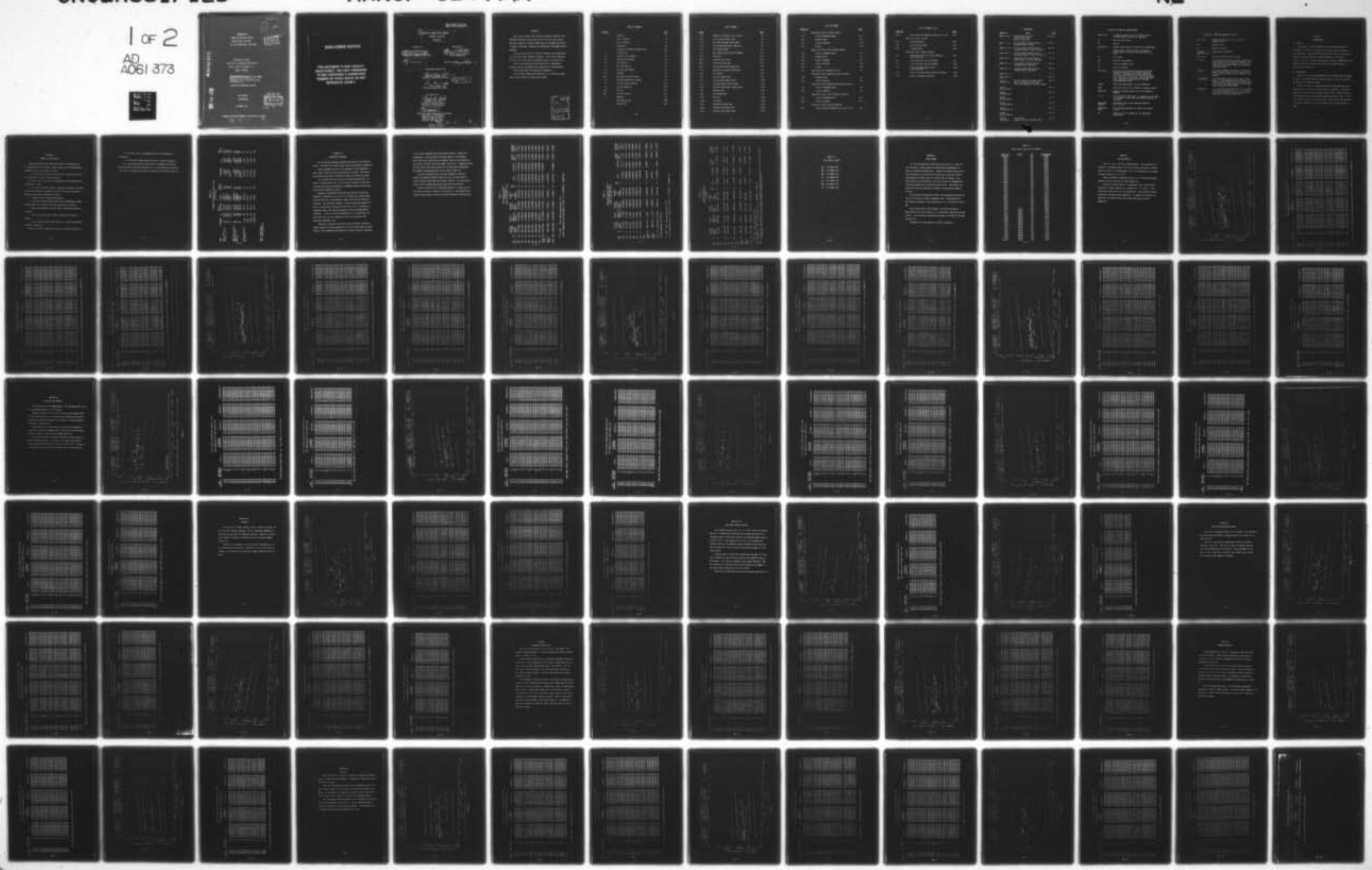

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OGDEN AIR LOGISTICS CENTER
UNITED STATES AIR FORCE
HILL AIR FORCE BASE, UTAH 84406

PROPELLANT SURVEILLANCE REPORT LGM-30F STAGE II ANB-3066

PROPELLANT LABORATORY SECTION

MANCP REPORT

NR 324 (75)

SEPTEMBER 1975

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MANCP REPORT NR 324 (75)
MMEMP PROJECT M52256M-3MP

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PROPELLANT SURVEILLANCE REPORT,

LGM-30F, STAGE II,

ANB-3066,

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ABSTRACT

This report contains test results on Stage II, LGM-30 F and G, ANB-3066 propellant from unlined cartons and nine lined cartons. Data were compared to previous MANCP data to determine the effects of aging on ANB-3066. Testing was accomplished under MMEMP Project 4MP-054P.

Unlined carton data for a specific parameter was consolidated into a single linear regression analysis. "Worst lots" described in Section III, were used in regression analysis of three tests.

One lot with average tensile properties was subjected to further testing to determine other properties of the propellant.

Lined carton data are presented in Appendix A.

Statistically significant trends are not of sufficient magnitude to cause failure in twenty-four months.

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REFERENCES

Report Nr	Title	Date
MAGCP 75 (67)	Zero-Time Test Results LGM-30 Second Stage Wing VI Propellant	13 Jan 67
MAGCP 111 (67	ATP Test Results LGM-30 Stage II Propellant Wing VI Phase	1 Dec 67
MAGCP 142 (68)	ATP Test Results LGM-30 Stage II Propellant Wing VI, Phase 1 Series II	Nov 68
MAGCP 188 (70)	ATP Test Results LGM-30 Stage II Propellant Wing VI, Phase 1 Series III	Jul 70
MAGCP 210 (71)	Propellant Surveillance Report LGM-30 Stage II (Wing 6 ANB-3066)	Jun 71
MAGCP 240 (72)	Propellant Surveillance Report LGM-30F Stage II ANB-3066	May 72
MAGCP 266 (73)	Propellant Surveillance Report LGM-30F Stage II ANB-3066	May 73
MAGCP 278 (73)	"	Oct 73
MANCP 298 (74)	"	May 74
Aerojet 0162-AS-6-1A	Ten Year Aging and Storage Program Wing VI Minuteman Second Stage Motors and Components Program Progress	Sep 67
Aerojet 0162-06-SAAS-7	"	Oct 70
Aerojet 0162-06-SAAS-8	"	Apr 71
Aerojet 0162-06-SAAS-9	"	Oct 71
Aerojet 0162-06-SAAS-10	"	Apr 72
Aerojet 0162-06-SAAS-12	"	Apr 73
Aerojet 0162-06-SAAS-13	"	Oct 74
Aerojet 0162-06AS-F	Final Report Appendix E-Motor Propellant Aging	Jan 74

GLOSSARY OF TERMS AND ABBREVIATIONS

Aging Trend	A change in properties or performance resulting from aging of material or component
CSA	Cross Sectional Area
DB	Dogbone
Degradation	Gradual deterioration of properties or performance
E	Modulus (psi), defined as stress divided by strain along the initial linear portion of the curve.
EB	End Bonded
EGL	Effective Gage Length
em	Strain at maximum stress
er	Strain at rupture
"F" ratio	The ratio of the variance accounted for by the regression function to the random unexplained variance. The regression function having the most significant "F" ratio is used for plotting data. The ratio is also used in detecting significant changes in random variation between succeeding time points
JANNAF	Joint Army, Navy, NASA, Air Force Committee
MANCP	Propellant Lab Section at Ogden Air Logistics Center
Ogden ALC	Ogden Air Logistics Center, Air Force Logistics Command
r or R	The Correlation Coefficient is a measure of the degree of closeness of the linear relationship between two variables
Regression Equation	The general form of the regression equation is Y = a + bx
Regression Line	Line representing mean test values with respect to time
S_b	Standard error of estimate of the regression coefficient

GLOSSARY OF TERMS AND ABBREVIATIONS (cont)

S_e or $S_{Y.X}$	Standard deviation of the data about the regression line
Sm	Maximum Stress
Sr	Stress at rupture
Standard Deviation (S_y)	Square root of variance
Strain Rate	Crosshead speed divided by the EGL
"t" test	A statistical test used to detect significant differences between a measured parameter and an expected value of the parameter (determines if regression slope differs from zero at the 95% confidence level)
Variance	The sum of squares of deviations of the test results from the mean of the series after division by one less than the total number of test results
3 Sigma Band	The area between the upper and lower 3 sigma limit. It can be expected that 99.73% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.
90-90 Band	It can be stated with 90% confidence that 90% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed

SECTION I

INTRODUCTION

A. PURPOSE:

The purpose of testing LGM-30F Stage II ANV-3066 propellant is to evaluate the effects of aging on operational motors containing this propellant. Propellant data obtained from this test period are related to previous testing of ANB-3066 beginning with Phase A (Jan 72 - Dec 73). Testing was performed according to MMEMP Directive GTD-2C, Amendment 1, MMEMP Project 4MP-054P and MANCP Projects 4185-12-73 and 4186-12-73.

B. BACKGROUND:

Service life testing of ANB-3066 block propellant began at OO/ALC in 1966. This report contains data from Phase A (four test periods) and Phase B (one period) testing.

Failure criteria for propellant which were developed from structural analysis are given in Aerojet Report 0162-06AS-F. Inner bore hoop strain failure is the predicted failure mode. Failure criterion for allowable strain for storage and ground handling at 60°F is 4.9%. This value decreases to 4.3% for booster flight (First stage burning) at 60°F and increases to 11.5% for flight (Second stage burning) at 60°F.

SECTION II

SUMMARY OF TEST RESULTS

Regression analyses are shown in Sections IV through XIV and are summarized in this section. Unless "worst lots" are referenced, statements refer to testing of all lots.

1. Low rate tensile shows a statistically significant increase in all parameters except stress at rupture.

For "worst lots" only strain at maximum stress and modulus show a significant trend.

2. Very low rate tensile shows a significant increase in strains and stress at maximum as opposed to "worst lots" which were chosen because of significant decreases in strain.

3. Hardness shows a significant increase.

4. High rate triaxial tensile does not show significant trends, although "worst lots" show a significant decrease in stresses.

5. High rate hydrostatic tensile shows a significant decrease in strains.

6. Low rate biaxial tensile shows a significant increase in strains.

7. Stress relaxation shows that there is a significant decrease in modulus at 1000 sec.

"Worst lots" show a significant increase at 10 sec and 1000 sec.

8. Gel swell ratio is decreasing and cross-link density is increasing.

9. Only minimal changes have been noted in thermal properties.

10. Lined carton data are statistically different from unlined carton data from the same propellant lots. Insufficient data covering a very short age span have accrued to establish trends (See Appendix A).

TABLE 2-1

SUMMARY OF STATISTICS FOR ALL LOTS
(Three Tests)

Test	Parameter	N	Age At Last Test	Slope	Sig of Slope *	Intercept	r	Sig of r *
Very Low Rate Tensile, 2×10^{-4}	em	1910	110 Mo	.0002478	Sig	15715	.24699	Sig
	Sm	1908	110 Mo	.03952	Sig	78.5937	.1059	Sig
	er	1910	110 Mo	.0002638	Sig	.16121	.24312	Sig
	Sr	1910	110 Mo	.02685	Sig	73.5781	.06086	Sig
	E	1910	110 Mo	-.32207	Sig	585.79	-.05977	Sig
High Rate Triaxial 1000 in/in/min 600 psi	em	189	110 Mo	.000006365	NS	.22449	.004266	NS
	Sm	189	110 Mo	-.091522	NS	585.9287	-.0391	NS
	er	189	110 Mo	-.0000969	NS	.25005	-.0646	NS
	Sr	189	110 Mo	-.0508	NS	573.359	-.02459	NS
	E	189	110 Mo	.34981	NS	6564.048	.00695	NS
Stress Relaxation 3% 77°F	$E_{(10)}$	309	109 Mo	.0362556	NS	758.6938	.00527	NS
	$E_{(50)}$	309	109 Mo	-.28341	NS	618.7769	-.05321	NS
	$E_{(100)}$	309	109 Mo	-.34148	NS	576.0851	-.06997	NS
	$E_{(1000)}$	309	109 Mo	-.48636	Sig	466.9520	-.12507	Sig

*Sig = Significant
NS = Not significant

SECTION III

STATISTICAL APPROACH

The statistical approach presented here applies to the unlined cartons. Statistics for lined carton data are presented in Appendix A.

Linear regression was used as the method of data evaluation. A least squares trend line was established for the data. This method was applied to data which included all Phase A and Phase B testing.

All available data was classified by manufacturing lots. In order to determine what lots, if any, could be pooled, a succession of linear regressions was employed to determine those lots which had statistically significant trends.

Analysis of covariance techniques were applied to each test parameter to determine if all lots in a statistically similar group could be pooled for trend analysis. Age at test was the covariant parameter. This procedure computes a linear regression estimate for each lot and performs appropriate statistical tests to determine if regression slopes and intercepts among the lots are significantly different. If the lot-to-lot differences are not significant, the data from these lots are combined to obtain an estimate of the population regression line.

Using this technique, seven lots could be pooled to provide a single estimate for each parameter for the three tests (Very Low Rate Tensile, Stress Relaxation and High Rate Triaxial Tensile) considered

to be the most important for motor stress analysis. These lots encompassed a cross-section of the motor ages in the inventory.

These seven lots, which have the steepest slope in the direction of the failure criteria, have been termed "worst lots". Regression plots for the "worst lots" are provided for the three tests referenced. The symbols representing each lot are shown in Table 3-4.

The data representing all lots were combined to provide a composite regression analysis except for Very Low Rate Tensile, Stress Relaxation and High Rate Triaxial Tensile. Only those parameters having a significant aging trend have been reported.

Computed statistics for covariance analysis of strain at maximum stress are given in Tables 3-1 through 3-3. This parameter was chosen because failure criteria for strain capability are available.

TABLE 3-1

Very Low Rate Tensile
.0002 in/min
Strain at Maximum Stress

Lot Nr	df	Adj Sum of Squrs of X ($\sum x^2$)	Adj Sum of Cross Prod ($\sum xy$)	Adj Sum of Squrs of Y ($\sum y^2$)	Residual Sum of Squares	Res df	Slope	Intercept	Correl. Coeff R^2	Residual Std Dev S_e
006	27	5753.0000	-0.73442382	0.00580502	0.00569806	26	-0.00013635	0.18326658	0.01842	0.01480
015	44	8613.2500	-1.61010740	0.01535892	0.01505794	43	-0.00018693	0.18469876	0.01959	0.01871
027	60	8551.2500	-4.05688470	0.01875687	0.01683220	59	-0.00047442	0.20315974	0.10261	0.01689
028	45	4871.2500	-2.55688470	0.01106358	0.00972148	44	-0.00052489	0.20149815	0.12130	0.01486
035	34	3162.1718	-1.36196890	0.011901855	0.011315245	33	-0.00043070	0.19551992	0.04928	0.01852
041	78	11384.1250	-1.05346670	0.03294373	0.03284624	77	-0.00009254	0.17795896	0.06296	0.02065
043	44	5141.6445	0.89164733	0.01529789	0.01514326	43	0.00017342	0.16783958	0.01011	0.01877
within lots	332	47476.6910	-10.53208900	0.11112785	0.10879141	331	-0.00022184	0.1844958	0.02102	0.01813
Among lots	6	130312.5000	-9.42005920	0.00367641	0.00299546	5	-0.00007229		0.18522	0.02448
Total	338	177789.2500	-19.95214000	0.11480426	0.11256515	337	-0.00011222	0.1790989	0.01950	0.01828

$F = 1.5117$ $F_{(\alpha = .05)(12 \text{ and } 325 \text{ DF})} = 1.75$

"Total" Regression line represents all data: $Y = 0.17884288 - 0.0001075(X)$

TABLE 3-2

High Rate Triaxial Tensile
1750 in/min 600 psi
Strain at Maximum Stress

Lot Nr	df	Adj Sum of Squrs of X ($\sum x^2$)	Adj Sum of Cross Prod ($\sum xy$)	Adj Sum of Squrs of Y ($\sum y^2$)	Residual Sum of Squares	Res df	Slope	Intercept	Correl. Coeff R^2	Residual Std Dev S_e
006	3	576.0000	-0.21960	0.00010925	0.00002554	2	-0.0003812	0.25473	0.7062	0.00357
015	5	910.8359	1.71780	0.00619912	0.00297837	4	0.00188043	0.66231	0.5195	0.02728
027	5	85.3359	-.73329	0.00811326	0.00181209	4	-.00859299	0.63627	0.7766	0.02128
028	5	625.3359	0.15229	0.00216440	0.00212730	4	0.00024354	0.21612	0.01713	0.02306
035	5	129.3359	0.42203	0.01029180	0.00891470	4	0.00326303	0.09747	0.1338	0.04720
041	9	1357.6015	-0.61362	0.00271830	0.00244090	8	-0.00045198	0.24300	0.1020	0.01747
*043										
within lots	32	3684.4453	0.72059	0.02959600	0.02945500	31	0.00019558	0.20814	0.004762	0.03082
Among lots	5	18088.3670	-1.14955	0.00582510	0.00575210	4	-0.006355		0.01254	0.03792
Total	37	21772.8120	-0.42895	0.03542130	0.03541290	35	-0.00001970	0.21936	0.000236	0.03136

*No data available for lot 043

$F = 2.431 \quad F_{(\alpha = .05)\ (10 \text{ and } 26 \text{ DF})} = 2.49$

"Total" regression line to represent all data: Y = 0.21935 - 0.00001970 (X)

TABLE 3-3

Stress Relaxation
Modulus at 1000 Seconds
3% Strain

Lot Nr	df	Adj Sum of Squrs of X (Σx^2)	Adj Sum of Cross Prod (Σxy)	Adj Sum of Squrs of Y (Σy^2)	Residual Sum of Squares	Res df	Slope	Intercept	Correl. Coeff R^2	Residual Std Dev S_e
006	9	121.6000	1860.0000	97864.0000	69413.3120	8	15.296039	126.02685	0.29071605	93.14861
015										
027	43	32385.5620	7829.5625	222652.0000	220759.0600	42	0.241761	386.58813	0.00850153	72.49943
028	35	15276.7500	1421.0000	64895.0000	64762.8200	34	0.093017	436.43164	0.00203679	43.64389
035										
041	28	6019.8750	-10969.3750	388807.0000	368818.6200	27	-1.822193	536.99682	0.01504936	116.87578
043										
within lots	115	53803.7850	141.1875	744218.0000	744217.6200	114	0.002624	419.24340	0.00000047	80.79743
Among lots	3	21108.8390	34888.8120	66550.0000	8885.5781	2	1.652805		0.86648279	66.65425
Total	118	74912.6250	35030.0000	840768.0000	824387.5600	117	0.467611	396.89672	0.01948269	83.94074

$F = 2.572$ $F_{(\alpha = .05)(6 \text{ and } 141 \text{ DF})} = 2.973$

Use Total Regression Line to represent all data: $Y = 396.89672 + .467611\,(X)$

Note: Lots 015, 035, 043 consisted of data at only 1 time point on stress relaxation and were not included in analysis of covariance. All lots were used in regression analysis characterization plots.

TABLE 3-4

Plot Symbol Legend

□	Lot Number 006
⬡	Lot Number 015
△	Lot Number 027
+	Lot Number 028
×	Lot Number 035
◇	Lot Number 041
Y	Lot Number 043

SECTION IV

TEST PROGRAM

All carton propellant on hand manufactured prior to 1 May 1972 was subjected to random selection representing approximately six years of propellant manufacturing. Twenty-six percent of this available propellant was set aside for testing over a two year interval. Approximately one-fourth was to be tested each six months. This propellant was then sub-divided into three groups for determination of failure properties and characterization tests. This report contains data from the first group of Phase B testing and all Phase A testing.

One carton was recalled for further testing based on the mean of the low rate tensile strain at maximum stress. Characterization data (failure envelope, strain dilatation, etc.) are given in Section XIV.

Motor serial number, batch number, lot number and date of manufacture are listed in Table 4-1 for propellant tested from unlined cartons. Tests and data evaluations are given in Sections IV through Section XIV.

Information on lined cartons is given in Appendix A.

TABLE 4-1

Motor Serial, Batch and Lot Numbers

Motor S/N	Batch	Lot	Date of Mfg.
AA20018		002	65070
20028		005	65111
20037		005	65126
20053		006	65193
20098		004	65279
20142		009	66003
20176		012	66060
20187		010	66074
20203		010	66101
20247		015	66165
20275		014	66214
20296		017	66242
20317		018	66277
20339		016	66300
20357		019	66322
20383		018	67009
20401		020	67037
20419		022	67066
20447		022	67121
20463		024	67159
20479		024	67213
20505		025	67306
20529		027	68037
20557		029	68153
20569		029	68197
20577		028	68195
20583		028	68241
20585		028	68240
20633		032	69035
20645		032	69073
20672		033	69203
20702	M4709	035	69293
20734	M4907	036	70089
20772	M4952	039	70188
20805	M4931	041	70278
20817	M4901	043	70320
20836	M4954	043	71033
20868	M4946	042	71127
20872	M4918	042	71137
20888	M4919	045	71172
20899	M4949	045	71200
20914	M4912	047	71229
20922	M4936	047	71256
20939	M5101	048	71292
20960	M4960	048	71344
20973	M4978	048	72120
20982	M4954	049	72046
20990	M4909	050	72067
20994	M4972	049	72081
AA21001	M4933	050	72122

SECTION V

LOW RATE TENSILE

This test uses a 1/2" thick JANNAF dogbone. The specimens are tested at a crosshead speed of 2.0 in/min (strain rate 0.667 in/in/min based on an EGL of 3.0 determined by use of an electrical strain gage). Storage temperature is 70 $\pm$ 10°F.

Phase A and Phase B propellant aged 14 to 110 months and tested through 74182 has been used in these regressions.

Except for maximum stress, all parameters show a statistically significant increase (Figures 5-1 through 5-4). "F" ratio, "t" and correlation coefficient R are all significant. The trend for strains indicate an increased strain capability. No ageout for at least two years past the oldest data point is predicted based on strain capability.

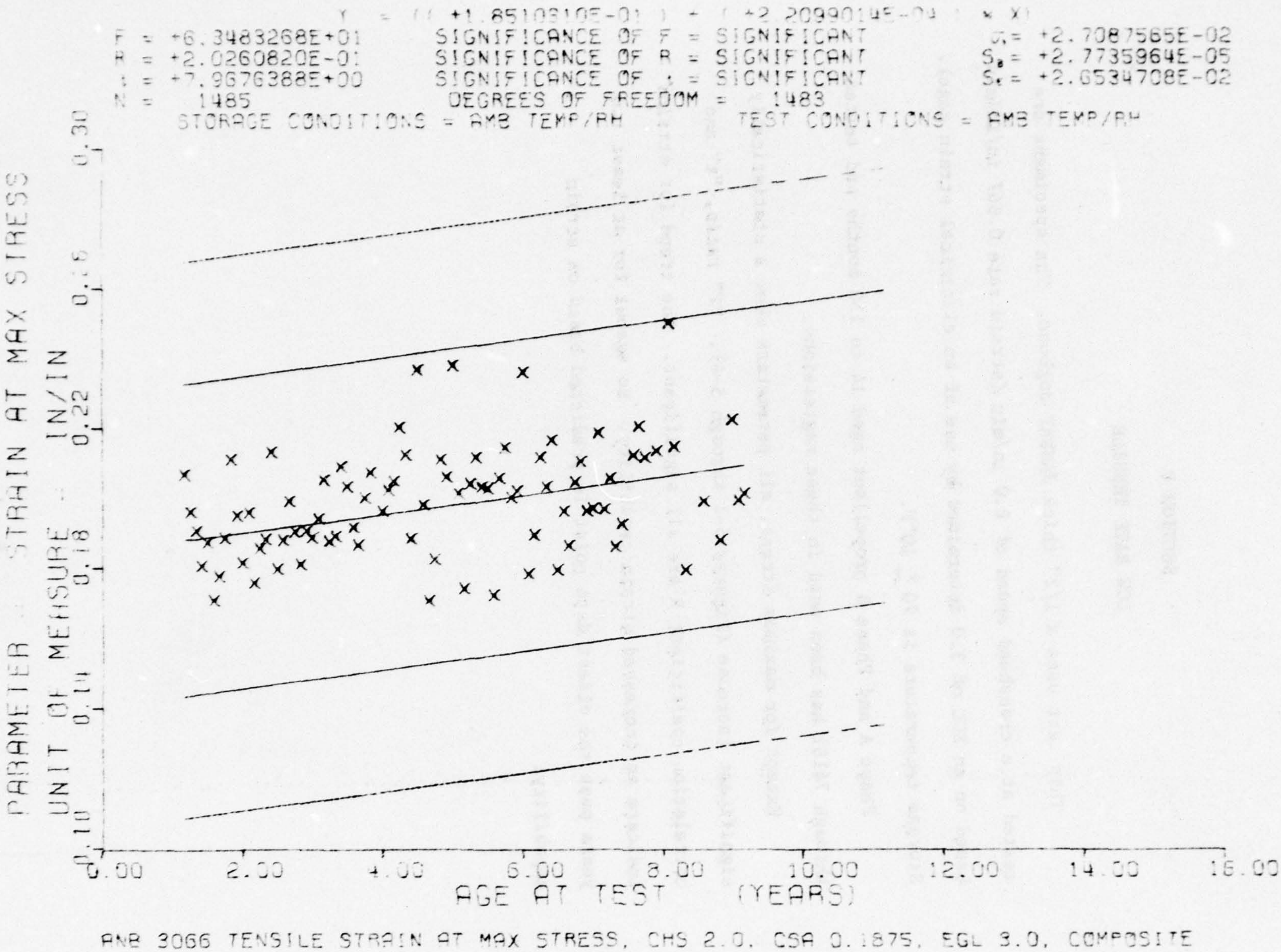

Y = ((+1.8510310E-01) + (+2.2099014E-04) * X)
F = +6.3483268E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = +2.0260820E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +7.9676388E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 1485 DEGREES OF FREEDOM = 1483
σ = +2.7087565E-02
Sₐ = +2.7735964E-05
Sₑ = +2.6534708E-02
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.10
0.14
0.18
0.22
0.26
0.30
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
ANB 3066 TENSILE STRAIN AT MAX STRESS, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

Figure 5-1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
14.0	10	[illegible]	[illegible]	+2.3299998E-01	+1.5099996E-01	+1.8819695E-01
15.0	10	+1.9539968E-01	+2.3102047E-02	+2.3299998E-01	+1.5999996E-01	+1.8841791E-01
16.0	15	+1.9093292E-01	+2.0487782E-02	+2.1899998E-01	+1.4199995E-01	+1.8863892E-01
17.0	15	+1.8036612E-01	+2.0716432E-02	+2.1699994E-01	+1.4009994E-01	+1.8885987E-01
18.0	5	[illegible]	[illegible]	[illegible]	+1.5099997E-01	+1.8908089E-01
19.0	20	+1.7103952E-01	+1.7377661E-02	+2.0299994E-01	+1.4069999E-01	+1.8930190E-01
20.0	25	+1.7731545E-01	+1.3661673E-02	+2.0699995E-01	+1.5609997E-01	+1.8952286E-01
21.0	33	+1.8575110E-01	+2.0775160E-02	+2.3299998E-01	+1.5299999E-01	+1.8974387E-01
22.0	10	+2.1139956E-01	+1.9725362E-02	+2.4679994E-01	+1.8259996E-01	+1.8996483E-01
23.0	15	+1.9530630E-01	+1.3652777E-02	+2.1619999E-01	+1.5299999E-01	+1.9018584E-01
24.0	35	+1.8270100E-01	+1.2661611E-02	+2.0799994E-01	+1.5629994E-01	+1.9040685E-01
25.0	25	+1.9623160E-01	+1.5453564E-02	+2.2499996E-01	+1.7669999E-01	+1.9062781E-01
26.0	25	+1.7635566E-01	+1.5425735E-02	+2.0439998E-01	+1.5349996E-01	+1.9084882E-01
27.0	25	+1.8555556E-01	+1.5840499E-02	+2.2999995E-01	+1.5999996E-01	+1.9106978E-01
28.0	10	+1.8649962E-01	+1.5996684E-02	+2.1799999E-01	+1.6599994E-01	+1.9129079E-01
29.0	10	+2.1348959E-01	+1.4580120E-02	+2.2969996E-01	+1.8639999E-01	+1.9151180E-01
30.0	15	+1.7539959E-01	+2.0573402E-02	+2.0299994E-01	+1.4399999E-01	+1.9173276E-01
31.0	10	+1.8510965E-01	+1.3016340E-02	+1.9999998E-01	+1.6609997E-01	+1.9195377E-01
32.0	40	+1.9436704E-01	+2.7571913E-02	+2.5999999E-01	+1.5699994E-01	+1.9217473E-01
33.0	20	+1.9060957E-01	+1.2064653E-02	+2.0999997E-01	+1.6499996E-01	+1.9239574E-01
34.0	10	+1.8135976E-01	+1.2699895E-02	+2.0099997E-01	+1.6399997E-01	+1.9261676E-01
35.0	25	+1.9131516E-01	+1.5729552E-02	+2.2739994E-01	+1.6609996E-01	+1.9283771E-01
36.0	25	[illegible]	+2.4965111E-02	+2.7599999E-01	+1.3699998E-01	+1.9305872E-01
37.0	30	+1.9435626E-01	+2.5555936E-02	+2.4199973E-01	+1.2699997E-01	+1.9327968E-01
38.0	10	+2.0557961E-01	+1.3009457E-02	+2.3499998E-01	+1.7599999E-01	+1.9350069E-01
39.0	5	+1.8601993E-01	+1.5750211E-02	+2.0929998E-01	+1.6509997E-01	+1.9372171E-01
40.0	10	+1.8949973E-01	+2.3351305E-02	+2.0999997E-01	+1.5299999E-01	+1.9394266E-01
41.0	5	+2.0439975E-01	+6.5556963E-03	+2.1609994E-01	+1.9999998E-01	+1.9416368E-01
42.0	10	+2.0557974E-01	+1.9927829E-02	+2.2979998E-01	+1.6139996E-01	+1.9438463E-01
43.0	20	+1.9159601E-01	+1.2035652E-02	+2.0919996E-01	+1.6009998E-01	+1.9460564E-01
44.0	15	[illegible]	+3.0569644E-02	+2.1699994E-01	+1.2599998E-01	+1.9482666E-01

... 3000 TENSILE STRAIN AT MAX STRESS, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
45.0	20	+2.0[illegible]E-01	+1.[illegible]E-02	+2.3099994E-01	+1.6519999E-01	+1.9504761E-01
46.0	10	+2.0755960E-01	+1.3981922E-02	+2.2399997E-01	+1.7849999E-01	+1.9526863E-01
48.0	10	+1.9551968E-01	+2.3571137E-02	+2.2499996E-01	+1.6299998E-01	+1.9571059E-01
49.0	15	+2.0255285E-01	+1.3855645E-02	+2.1999996E-01	+1.8049997E-01	+1.9593161E-01
50.0	21	[illegible]	+2.1357905E-02	+2.3[illegible]E-01	+1.67[illegible]E-01	+1.9615[illegible]E-01
51.0	10	+2.2055978E-01	+3.1831875E-02	+2.6599997E-01	+1.8519997E-01	+1.9637356E-01
52.0	21	+2.1672508E-01	+1.3865363E-02	+2.4199998E-01	+1.8299998E-01	+1.9659453E-01
53.0	10	+1.8856968E-01	+1.3377298E-02	+2.0999997E-01	+1.6849994E-01	+1.9681555E-01
54.0	10	+2.3609969E-01	+1.4449790E-02	+2.5699996E-01	+2.1699994E-01	+1.9703656E-01
55.0	13	+1.9639966E-01	+3.8505883E-02	+2.7699995E-01	+1.4329999E-01	+1.9725751E-01
56.0	15	+1.7667292E-01	+2.7774285E-02	+2.1799999E-01	+1.2899994E-01	+1.9747853E-01
57.0	10	+1.8275964E-01	+4.5323591E-02	+2.4829995E-01	+1.3969999E-01	+1.9769948E-01
58.0	15	+2.1129945E-01	+1.1606739E-02	+2.2799998E-01	+1.9759994E-01	+1.9792050E-01
59.0	20	+2.0525876E-01	+1.9925651E-02	+2.3299998E-01	+1.5299999E-01	+1.9814151E-01
60.0	10	+2.3619971E-01	+8.0454655E-03	+2.5000000E-01	+2.2499996E-01	+1.9836246E-01
61.0	15	+2.0159953E-01	+2.1616433E-02	+2.3479998E-01	+1.6599994E-01	+1.9858348E-01
62.0	10	+1.7444960E-01	+2.3761589E-02	+2.1199995E-01	+1.2699997E-01	+1.9880443E-01
63.0	25	+2.0442748E-01	+2.5091365E-02	+2.4299997E-01	+1.5249997E-01	+1.9902545E-01
64.0	5	+2.1179[illegible]E-01	+8.1230483E-03	+2.2359997E-01	+2.0379996E-01	+1.9924646E-01
65.0	20	+2.0359963E-01	+2.9722496E-02	+2.4499994E-01	+1.5299999E-01	+1.9946742E-01
66.0	28	+2.0509591E-01	+2.9298836E-02	+2.7269995E-01	+1.5599995E-01	+1.9968843E-01
67.0	35	+1.7259961E-01	+2.3236829E-02	+2.1999996E-01	+1.2899994E-01	+1.9990938E-01
68.0	35	+2.0[illegible]E-01	+2.5174341E-02	+2.7229994E-01	+1.7459994E-01	+2.0013040E-01
69.0	30	+2.1479624E-01	+2.3276206E-02	+2.6499998E-01	+1.7199994E-01	+2.0035141E-01
70.0	30	+2.0652957E-01	+2.0590531E-02	+2.3499995E-01	+1.3679999E-01	+2.0057237E-01
71.0	35	+2.0230531E-01	+2.9728436E-02	+2.4879997E-01	+1.3299995E-01	+2.0079338E-01
72.0	5	+2.3529987E-01	+1.0798347E-02	+2.5469994E-01	+2.2829997E-01	+2.0101433E-01
73.0	20	+1.7859959E-01	+2.2535007E-02	+2.0999997E-01	+1.3099998E-01	+2.0123535E-01
74.0	15	+1.8958827E-01	+2.9124088E-02	+2.2999995E-01	+1.4599996E-01	+2.0145636E-01
75.0	30	+2.1137125E-01	+2.0246297E-02	+2.4099999E-01	+1.6099995E-01	+2.0167732E-01
76.0	20	+2.0549955E-01	+2.0992055E-02	+2.3499995E-01	+1.6699999E-01	+2.0189833E-01

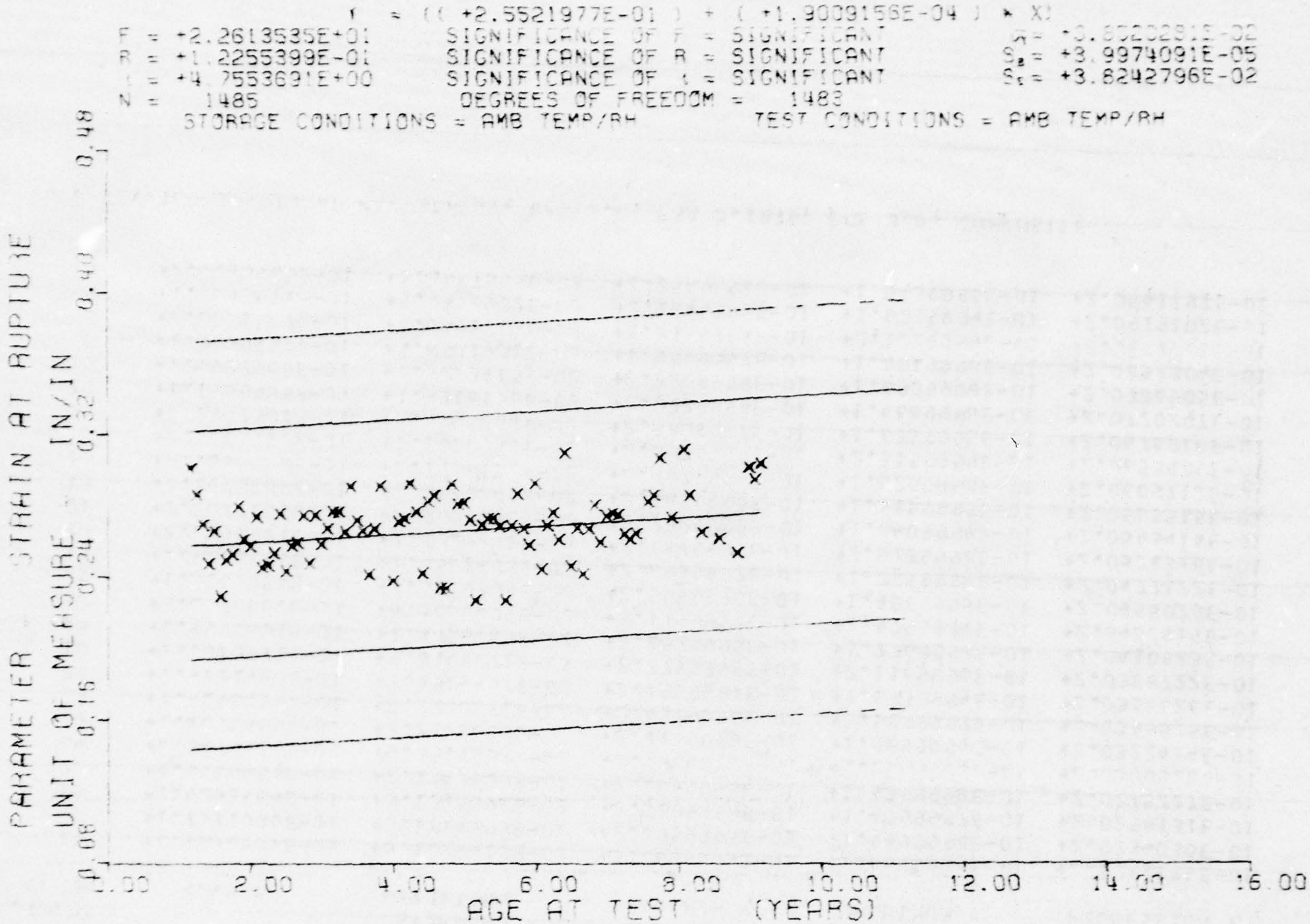
[illegible] TENSILE STRAIN AT MAX STRESS, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
77.0	14	[illegible]	[illegible]	[illegible]	+1.4899998E-01	+2.0211929E-01
78.0	9	+1.7971086E-01	+3.1814503E-02	+2.2959995E-01	+1.4499998E-01	+2.0234030E-01
79.0	15	[illegible]	+3.1345392E-02	+2.3809999E-01	+1.4999997E-01	+2.0256131E-01
80.0	2[illegible]	[illegible]	+2.1643600E-02	+2.2099995E-01	+1.4399999E-01	+2.0278227E-01
81.0	24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
82.0	20	+2.1059459E-01	+3.2122810E-02	+2.7199995E-01	+1.5699994E-01	+2.0322424E-01
83.0	[illegible]	[illegible]	+2.2740821E-02	+2.4179995E-01	+1.5899997E-01	+2.0344525E-01
84.0	20	+1.9721460E-01	+1.4514457E-02	+2.1969997E-01	+1.6739994E-01	+2.0366626E-01
85.0	10	+2.1673971E-01	+4.8145071E-03	+2.2799998E-01	+2.1169996E-01	+2.0388722E-01
86.0	15	[illegible]	[illegible]	+2.2529995E-01	+1.7769993E-01	+2.0410823E-01
87.0	30	[illegible]	[illegible]	+3.1199997E-01	+1.4799994E-01	+2.0432919E-01
88.0	25	[illegible]	+3.3239258E-02	+2.5599998E-01	+1.4589995E-01	+2.0455020E-01
89.0	15	[illegible]	+1.4557473E-02	+2.2939997E-01	+1.7059999E-01	+2.0477122E-01
91.0	10	+2.1247977E-01	+7.2329291E-03	+2.1979999E-01	+2.0139998E-01	+2.0521318E-01
92.0	21	+2.2077101E-01	+2.5009872E-02	+2.7829998E-01	+1.6409999E-01	+2.0543414E-01
93.0	15	[illegible]	+2.3630895E-02	+2.5439995E-01	+1.4859998E-01	+2.0565515E-01
[illegible]	15	[illegible]	[illegible]	+2.4079996E-01	+1.6259996E-01	+2.0609712E-01
97.0	[illegible]	[illegible]	[illegible]	[illegible]	+2.3559999E-01	+2.0653909E-01
[illegible]	1[illegible]	+2.1437501E-01	[illegible]	+2.5809997E-01	+1.6359996E-01	+2.0676010E-01
100.0	10	+1.7955985E-01	+1.9116156E-02	+2.0729994E-01	+1.4669996E-01	+2.0720207E-01
103.0	10	+1.9927966E-01	+1.5223415E-02	+2.3209995E-01	+1.6909998E-01	+2.0786505E-01
[illegible]	5	[illegible]	+5.6501931E-03	+1.9599997E-01	+1.8019998E-01	+2.0852806E-01
[illegible]	5	[illegible]	[illegible]	+2.3169994E-01	+2.1229994E-01	[illegible]
109.0	5	[illegible]	+9.9493932E-03	+2.1449995E-01	+1.9219994E-01	+2.0919102E-01
110.0	5	[illegible]	+1.5487685E-02	+2.2549998E-01	+1.9439995E-01	+2.0941197E-01

[illegible] TENSILE STRAIN AT MAX STRESS, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE



ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 2.0, EGL 3.0, CSA 0.1875, COMPOSITE

Figure 5 - 2

LINEAR REGRESSION ANALYSIS

ANALYSIS OF TIME SERIES

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
14.0	10	[illegible]	[illegible]	[illegible]	+2.3999994E-01	+2.5788104E-01
15.0	10	+2.5599969E-01	+4.3951598E-02	+3.6799997E-01	+2.2199994E-01	+2.5807112E-01
16.0	15	+2.5938622E-01	+2.5370952E-02	+3.2099997E-01	+2.2499996E-01	+2.5826120E-01
17.0	15	+2.4174628E-01	+3.7625606E-02	+3.2499998E-01	+2.0789998E-01	+2.5845128E-01
18.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+2.5864142E-01
19.0	20	+2.2933452E-01	+2.4353386E-02	+2.7399998E-01	+1.9429999E-01	+2.5883150E-01
20.0	25	+2.4975550E-01	+2.5710020E-02	+3.1499999E-01	+2.0119994E-01	+2.5902158E-01
21.0	33	+2.5294795E-01	+2.3857054E-02	+3.1699997E-01	+1.6979998E-01	+2.5921165E-01
22.0	10	+2.7997956E-01	+2.5345229E-02	+3.2649999E-01	+2.4419999E-01	+2.5940173E-01
23.0	15	[illegible]	+3.0159587E-02	+3.0069994E-01	+2.2299993E-01	+2.5959187E-01
24.0	35	+2.5745950E-01	[illegible]	[illegible]	+2.2839999E-01	+2.5978195E-01
25.0	25	+2.7412754E-01	+2.1993035E-02	+3.1989997E-01	+2.4149996E-01	+2.5997203E-01
26.0	25	+2.4557949E-01	[illegible]	+3.0489999E-01	+1.6719996E-01	+2.6016211E-01
27.0	25	+2.4571155E-01	+2.7762401E-02	+2.9299998E-01	+1.8399995E-01	+2.6035219E-01
28.0	10	[illegible]	[illegible]	+2.9299998E-01	+2.2599995E-01	+2.6054233E-01
29.0	10	[illegible]	[illegible]	+3.1239999E-01	+2.2599995E-01	+2.6073241E-01
30.0	15	[illegible]	[illegible]	+2.9239994E-01	+1.9499999E-01	+2.6092249E-01
31.0	10	+2.5763972E-01	[illegible]	+2.9499995E-01	+2.0179998E-01	+2.6111257E-01
32.0	40	[illegible]	+3.4105575E-02	+3.2539999E-01	+1.6999995E-01	+2.6130264E-01
33.0	20	[illegible]	[illegible]	[illegible]	[illegible]	+2.6149278E-01
34.0	10	+2.4600968E-01	+1.9463892E-02	+2.8589999E-01	+2.3089998E-01	+2.6168286E-01
35.0	25	+2.7509951E-01	+3.0767731E-02	+3.3009999E-01	+2.3499995E-01	+2.6187294E-01
36.0	25	[illegible]	[illegible]	+3.1429994E-01	+1.7409993E-01	+2.6206302E-01
37.0	30	[illegible]	[illegible]	+3.3619995E-01	+1.4799994E-01	+2.6225310E-01
38.0	10	[illegible]	+4.1062933E-02	+3.2299995E-01	+2.0599997E-01	+2.6244324E-01
39.0	5	+2.7717971E-01	+2.2038750E-02	+2.9609995E-01	+2.3899996E-01	+2.6263332E-01
40.0	10	+2.6589971E-01	+3.2065953E-02	+3.0099999E-01	+2.1699994E-01	+2.6282340E-01
41.0	5	+2.9119968E-01	+5.1858118E-03	+2.9799997E-01	+2.8599995E-01	+2.6301348E-01
42.0	10	+2.7224957E-01	+3.0219035E-02	+3.0709999E-01	+2.1999996E-01	+2.6320362E-01
43.0	20	+2.6533954E-01	+1.3072579E-02	+2.9299998E-01	+2.3659998E-01	+2.6339370E-01
44.0	15	[illegible]	+4.7418335E-02	+2.9699999E-01	+1.4199995E-01	+2.6358377E-01

[illegible] 3066 TENSILE STRAIN AT RUPTURE, CHS 2.0, EGL 3.0, CSA 0.1875, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
[illegible]	[illegible]	[illegible]	+3.3154241E-02	+3.0699998E-01	+1.8559998E-01	+2.6377385E-01
46.0	10	+2.9135967E-01	+1.8304334E-02	+3.2179999E-01	+2.5819998E-01	+2.6396393E-01
48.0	10	+2.3637965E-01	+3.2428902E-02	+2.9199999E-01	+1.8779999E-01	+2.6434415E-01
49.0	15	+2.7153952E-01	+2.0378246E-02	+2.9499995E-01	+2.1099996E-01	+2.6453423E-01
50.0	21	+2.7510431E-01	+2.0325801E-02	+3.0499994E-01	+2.3099994E-01	+2.6472431E-01
51.0	10	+2.9308562E-01	+1.3261117E-02	+3.3399995E-01	+2.6659995E-01	+2.6491439E-01
52.0	21	+2.7710514E-01	+2.4777659E-02	+3.1839996E-01	+2.0099997E-01	+2.6510453E-01
53.0	10	+2.4256968E-01	+1.0212326E-02	+2.6699996E-01	+2.3299998E-01	+2.6529461E-01
54.0	10	+2.6239961E-01	+1.4585328E-02	+3.0199998E-01	+2.5399994E-01	+2.6548469E-01
55.0	13	+2.[illegible]09981E-01	+6.2125450E-02	+3.9879995E-01	+2.0389997E-01	+2.6567476E-01
56.0	[illegible]	[illegible]	[illegible]	[illegible]	+1.6499996E-01	+2.6586484E-01
57.0	10	+2.5401963E-01	+6.0421109E-02	+3.2399994E-01	+1.7149996E-01	+2.6605498E-01
58.0	15	+2.9255948E-01	+1.3505181E-02	+3.1499999E-01	+2.7079999E-01	+2.6624506E-01
59.0	26	+2.5134588E-01	+3.1154754E-02	+3.2399994E-01	+2.0399999E-01	+2.6643514E-01
60.0	10	+2.6229569E-01	+2.3222200E-02	+3.1699994E-01	+2.4299997E-01	+2.6662522E-01
61.0	15	+2.7652628E-01	+3.4313184E-02	+3.1449997E-01	+1.9579994E-01	+2.6681530E-01
62.0	10	+2.2752966E-01	+4.3487637E-02	+2.8899997E-01	+1.6199994E-01	+2.6700544E-01
63.0	25	[illegible]	+3.3659808E-02	+3.2299999E-01	+2.0099997E-01	+2.6719552E-01
64.0	5	+2.7505984E-01	+2.3832813E-02	+3.0269998E-01	+2.3809999E-01	+2.6738560E-01
65.0	20	+2.7519995E-01	+3.1584841E-02	+3.3199995E-01	+2.1699994E-01	+2.6757568E-01
66.0	28	+2.5658170E-01	+2.4612983E-02	+3.2829999E-01	+2.0399999E-01	+2.6776576E-01
67.0	35	+2.2745568E-01	+5.1610615E-02	+3.5599994E-01	+1.4899993E-01	+2.6795589E-01
[illegible]	33	[illegible]	+2.4446236E-02	+3.3129996E-01	+2.2009998E-01	+2.6814597E-01
69.0	30	+2.6691291E-01	+2.5732023E-02	+3.2999994E-01	+2.2199994E-01	+2.6833605E-01
70.0	30	+2.6756633E-01	+3.9629047E-02	+3.4999996E-01	+1.7189997E-01	+2.6852613E-01
71.0	35	+2.5635569E-01	+4.7254203E-02	+3.3499997E-01	+1.4499998E-01	+2.6871627E-01
72.0	5	+2.9507973E-01	+5.0385862E-03	+3.0029994E-01	+2.8789997E-01	+2.6890635E-01
73.0	20	+2.4459959E-01	+4.4257347E-02	+3.2399994E-01	+1.5399998E-01	+2.6909643E-01
74.0	15	+2.6900633E-01	+2.9602463E-02	+3.2699996E-01	+2.1599996E-01	+2.6928651E-01
75.0	33	+2.7548437E-01	+2.6515759E-02	+3.2999998E-01	+2.0799994E-01	+2.6947659E-01
76.0	23	+2.6119953E-01	+2.2011210E-02	+2.9799997E-01	+2.2799998E-01	+2.6966673E-01

ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 2.0, EGL 3.0, CSA 0.1875, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

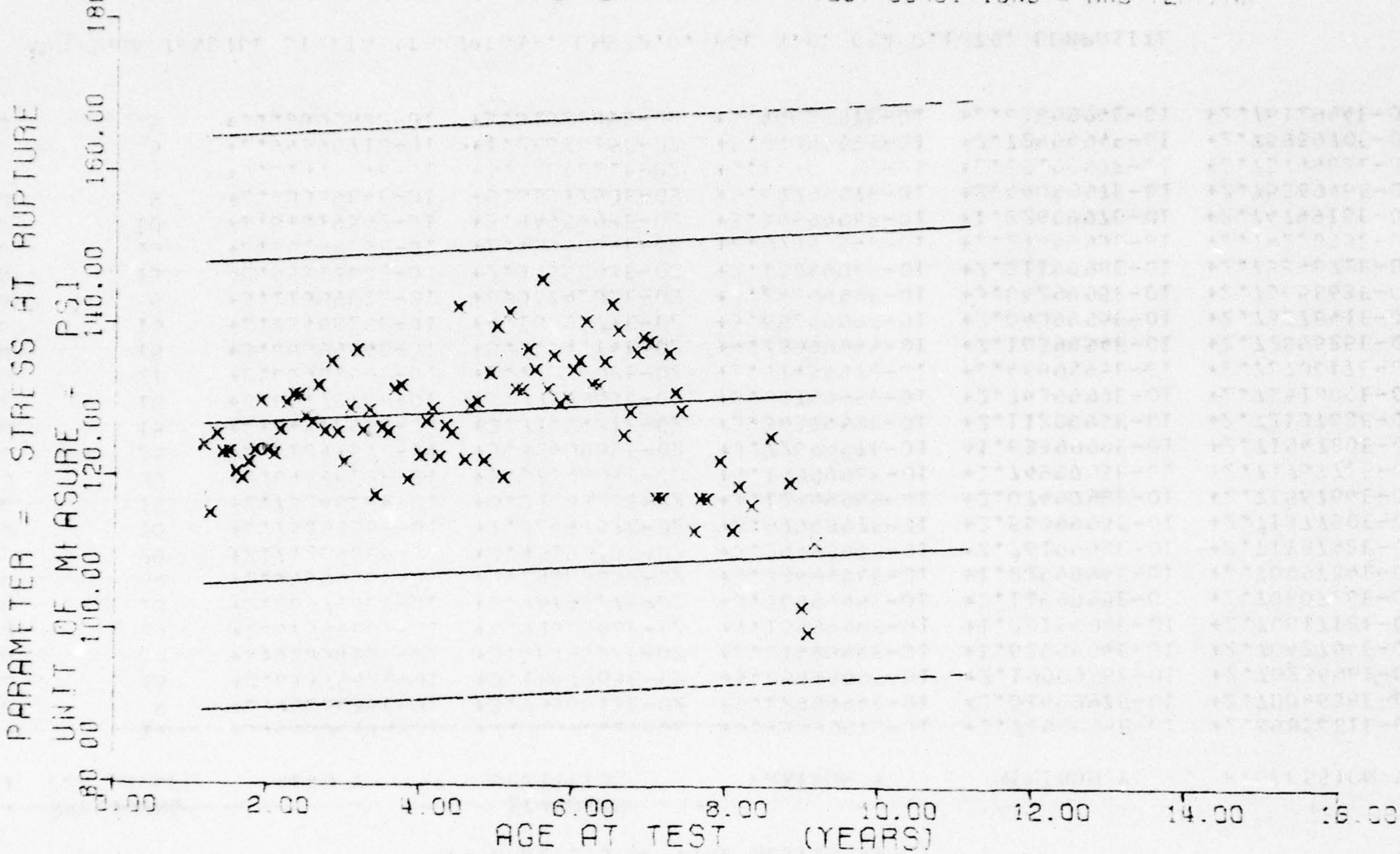
AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
77.0	14	[illegible]	[illegible]	[illegible]	+1.7199999E-01	+2.6985681E-01
78.0	9	+2.4520636E-01	+3.9566613E-02	+3.1899994E-01	+2.0169997E-01	+2.7004638E-01
79.0	15	+2.6737952E-01	+3.1897963E-02	+3.0599999E-01	+2.1999996E-01	+2.7023696E-01
80.0	20	+2.4205453E-01	+3.6634526E-02	+2.8199994E-01	+1.6199994E-01	+2.7042704E-01
81.0	24	[illegible]	+6.7152346E-02	+4.1699999E-01	+1.2819999E-01	+2.7061718E-01
82.0	20	+2.6057956E-01	+3.9474927E-02	+3.5099995E-01	+2.1199995E-01	+2.7080726E-01
83.0	34	[illegible]	+3.2400303E-02	+3.3349996E-01	+1.8299996E-01	+2.7099734E-01
84.0	20	+2.7428960E-01	+3.4519513E-02	+3.3949995E-01	+2.2619998E-01	+2.7118742E-01
85.0	10	+2.7509956E-01	+1.5654757E-02	+2.9799997E-01	+2.5509995E-01	+2.7137750E-01
86.0	15	+2.7524606E-01	+3.2168323E-02	+3.1299996E-01	+2.0749998E-01	+2.7156764E-01
87.0	30	+2.6429023E-01	+5.5864004E-02	+4.1499998E-01	+1.7499995E-01	+2.7175772E-01
88.0	25	+2.6124757E-01	+5.3243989E-02	+3.7269997E-01	+1.6339999E-01	+2.7194780E-01
89.0	15	+2.6447296E-01	+3.3159481E-02	+3.3439999E-01	+2.1129995E-01	+2.7213788E-01
91.0	10	+2.8247975E-01	+5.0719563E-03	+2.8979999E-01	+2.7439999E-01	+2.7251309E-01
92.0	21	[illegible]	+2.4223809E-02	+3.3149997E-01	+2.4899995E-01	+2.7270817E-01
93.0	15	+3.0609954E-01	+5.5654914E-02	+4.2809998E-01	+2.1659994E-01	+2.7289825E-01
95.0	15	+2.7540528E-01	+4.1309577E-02	+3.6529999E-01	+2.0409995E-01	+2.7327841E-01
97.0	5	+3.1153982E-01	+8.0674208E-03	+3.2429999E-01	+3.0429995E-01	+2.7365863E-01
98.0	15	+2.6551303E-01	+2.3755543E-02	+3.1309998E-01	+2.2119998E-01	+2.7384871E-01
100.0	10	[illegible]	[illegible]	[illegible]	[illegible]	+2.7422893E-01
103.0	10	+2.6181554E-01	+3.8495498E-02	+3.3959998E-01	+1.8269997E-01	+2.7479916E-01
105.0	5	+2.5355564E-01	+9.6551750E-03	+2.6779997E-01	+2.4409997E-01	+2.7536946E-01
[illegible]	5	[illegible]	[illegible]	[illegible]	+2.8719997E-01	+2.7574962E-01
108.0	5	+2.9459971E-01	+1.2667635E-02	+3.0439999E-01	+2.7299994E-01	+2.7593970E-01
110.0	5	[illegible]	[illegible]	+3.4469997E-01	+2.6169994E-01	+2.7612954E-01

ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 2.0, EGI 3.0, CSA 0.1875, COMPOSITE

Y = ((+1.2631548E+02) + (+4.6029283E-02) * X)

F = +1.2348264E+01   SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +1.2579301E+01
R = +9.0872356E-02   SIGNIFICANCE OF R = SIGNIFICANT S_a = +1.3098791E-02
t = +3.5140097E+00   SIGNIFICANCE OF t = SIGNIFICANT S_t = +1.2531477E+01
N = 1485   DEGREES OF FREEDOM = 1483

STORAGE CONDITIONS = AMB TEMP/RH   TEST CONDITIONS = AMB TEMP/RH



ANB 3066 TENSILE STRESS AT RUPTURE, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

Figure 5 - 3

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

TIME (PERIODS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
14.0	10	+1.2419999E+02	+6.1606030E+00	+1.3400000E+02	+1.1800000E+02	+1.2695982E+02
15.0	10	+1.1529998E+02	+1.0594023E+01	+1.3300000E+02	+1.0300000E+02	+1.2700592E+02
16.0	15	+1.2566665E+02	+1.4135399E+01	+1.4400000E+02	+1.0700000E+02	+1.2705194E+02
17.0	15	+1.2327459E+02	+7.2138767E+00	+1.3600000E+02	+1.1000000E+02	+1.2709797E+02
18.0	5	+1.2309999E+02	+5.4129474E+00	+1.3200000E+02	+1.1800000E+02	+1.2714401E+02
19.0	20	+1.2076191E+02	+5.4382292E+00	+1.2900000E+02	+1.1172999E+02	+1.2719003E+02
20.0	25	+1.1995832E+02	+8.8097096E+00	+1.4344999E+02	+1.0741999E+02	+1.2723606E+02
21.0	33	+1.2201999E+02	+1.0229520E+01	+1.3700000E+02	+1.0550000E+02	+1.2728208E+02
22.0	10	+1.2558587E+02	+5.9957571E+00	+1.3339999E+02	+1.1507998E+02	+1.2732812E+02
23.0	15	+1.3003796E+02	+8.5634546E+00	+1.4800000E+02	+1.1500000E+02	+1.2737414E+02
24.0	35	+1.2356839E+02	+8.7651784E+00	+1.4700000E+02	+1.1158999E+02	+1.2742018E+02
25.0	25	+1.2515190E+02	+6.5165871E+00	+1.4167999E+02	+1.1001998E+02	+1.2746621E+02
26.0	25	+1.2528111E+02	+1.0037713E+01	+1.5100000E+02	+1.0768998E+02	+1.2751223E+02
27.0	25	+1.2987316E+02	+7.9599400E+00	+1.4500000E+02	+1.1353999E+02	+1.2755827E+02
28.0	10	+1.3100000E+02	+6.5996632E+00	+1.4100000E+02	+1.2300000E+02	+1.2760429E+02
29.0	10	+1.3035192E+02	+8.3088336E+00	+1.4500000E+02	+1.2043998E+02	+1.2765032E+02
30.0	15	+1.2632731E+02	+1.3354176E+01	+1.4500000E+02	+1.0543998E+02	+1.2769635E+02
31.0	10	+1.2723294E+02	+1.0770292E+01	+1.4582998E+02	+1.1500000E+02	+1.2774238E+02
32.0	40	+1.3238241E+02	+9.8020187E+00	+1.5100000E+02	+1.1678999E+02	+1.2778842E+02
33.0	20	+1.2514642E+02	+5.1416051E+00	+1.3500000E+02	+1.1869999E+02	+1.2783444E+02
34.0	10	+1.3528693E+02	+7.4465640E+00	+1.4300000E+02	+1.2366999E+02	+1.2788047E+02
35.0	25	+1.2597514E+02	+1.1745123E+01	+1.4500000E+02	+1.1000000E+02	+1.2792649E+02
36.0	25	+1.2211672E+02	+8.7153156E+00	+1.4250000E+02	+1.0341999E+02	+1.2797253E+02
37.0	30	+1.2916531E+02	+1.2269836E+01	+1.3500000E+02	+1.0700000E+02	+1.2801855E+02
38.0	10	+1.3076590E+02	+1.1498204E+01	+1.5500000E+02	+1.2245999E+02	+1.2806459E+02
39.0	5	+1.2828793E+02	+3.2052395E+00	+1.3096998E+02	+1.2307998E+02	+1.2811062E+02
40.0	10	+1.2900000E+02	+7.2254944E+00	+1.4000000E+02	+1.2200000E+02	+1.2815664E+02
41.0	5	+1.1779998E+02	+1.0954451E+00	+1.1900000E+02	+1.1600000E+02	+1.2820268E+02
42.0	10	+1.2570692E+02	+6.7824858E+00	+1.4095999E+02	+1.1892999E+02	+1.2824870E+02
43.0	20	[illegible]	+4.2595112E+00	+1.3300000E+02	+1.1739999E+02	+1.2829473E+02
44.0	15	+1.3156665E+02	+1.1222644E+01	+1.5400000E+02	+1.2100000E+02	+1.2834075E+02

AMS 2066 TENSILE STRESS AT RUPTURE, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

LINEAR REGRESSION ANALYSIS

ANALYSIS OF TIME SERIES

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
46.0	20	+1.3215244E+02	[illegible]	+1.4450999E+02	+1.1906999E+02	+1.2838679E+02
47.0	10	+1.2939393E+02	+5.5669538E+00	+1.3102999E+02	+1.0971998E+02	+1.2843283E+02
48.0	10	+1.2509594E+02	+1.0506956E+01	+1.4625999E+02	+1.1254998E+02	+1.2852488E+02
49.0	15	+1.2746661E+02	+5.1216363E+00	+1.3569999E+02	+1.2000000E+02	+1.2857090E+02
50.0	21	+1.2925282E+02	+7.1808370E+00	+1.4700000E+02	+1.1900000E+02	+1.2861694E+02
51.0	10	+1.2237594E+02	+1.0229066E+01	+1.3500000E+02	+1.0843998E+02	+1.2866297E+02
52.0	21	+1.2693330E+02	+1.1789990E+01	+1.4100000E+02	+1.0235998E+02	+1.2870899E+02
53.0	10	+1.2979296E+02	+1.3659676E+01	+1.4100000E+02	+1.0508999E+02	+1.2875503E+02
54.0	10	+1.4250000E+02	+4.5785100E+00	+1.4900000E+02	+1.3700000E+02	+1.2880105E+02
55.0	15	+1.2253532E+02	+1.2643823E+01	+1.4300000E+02	+1.0037998E+02	+1.2884709E+02
56.0	15	[illegible]	[illegible]	+1.5000000E+02	+1.0631999E+02	+1.2889311E+02
57.0	10	+1.3019480E+02	+7.1624043E+00	+1.3729998E+02	+1.1575999E+02	+1.2893914E+02
58.0	15	+1.2246990E+02	+1.4750510E+01	+1.4800000E+02	+1.0816999E+02	+1.2898518E+02
59.0	26	+1.3354614E+02	+7.5772940E+00	+1.4500000E+02	+1.2000000E+02	+1.2903120E+02
60.0	10	+1.4000000E+02	+3.3209268E+00	+1.4500000E+02	+1.3500000E+02	+1.2907723E+02
61.0	15	+1.2029521E+02	+4.8272425E+00	+1.2915998E+02	+1.1336999E+02	+1.2912326E+02
62.0	10	+1.4133456E+02	+1.2946743E+01	+1.6200000E+02	+1.2600000E+02	+1.2916929E+02
63.0	25	[illegible]	[illegible]	+1.5400000E+02	+1.0556999E+02	+1.2921531E+02
64.0	5	+1.3170390E+02	+2.9354681E+00	+1.3503999E+02	+1.2737998E+02	+1.2926135E+02
65.0	20	+1.3704998E+02	+1.0303167E+01	+1.5700000E+02	+1.2200000E+02	+1.2930738E+02
66.0	28	+1.3430566E+02	+8.0835197E+00	+1.5900000E+02	+1.2443998E+02	+1.2935340E+02
67.0	35	+1.4519999E+02	+1.4335886E+01	+1.6900000E+02	+1.1400000E+02	+1.2939944E+02
68.0	[illegible]	[illegible]	[illegible]	+1.4500000E+02	+1.2135999E+02	+1.2944546E+02
69.0	30	+1.3326460E+02	+1.0783142E+01	+1.6100000E+02	+1.2204998E+02	+1.2949150E+02
70.0	30	+1.3332494E+02	+1.0731417E+01	+1.5630999E+02	+1.1600000E+02	+1.2953752E+02
71.0	35	+1.3037309E+02	+1.3991092E+01	+1.7000000E+02	+1.1400000E+02	+1.2958355E+02
72.0	5	+1.3441390E+02	+3.2135506E+00	+1.3845999E+02	+1.3066999E+02	+1.2962959E+02
73.0	20	+1.3334998E+02	+1.3084643E+01	+1.6700000E+02	+1.2000000E+02	+1.2967561E+02
74.0	15	+1.4079998E+02	+9.7921251E+00	+1.5500000E+02	+1.2100000E+02	+1.2972164E+02
75.0	35	+1.3244697E+02	+9.2513790E+00	+1.5800000E+02	+1.2400000E+02	+1.2976766E+02
76.0	20	+1.3229998E+02	+1.0285912E+01	+1.5500000E+02	+1.1700000E+02	+1.2981370E+02

ANB 3066 TENSILE STRESS AT RUPTURE, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
77.0	14	+1.3350000E+02	+1.0241519E+01	+1.5900000E+02	+1.2000000E+02	+1.2985972E+02
78.0	9	+1.4304101E+02	+1.2061227E+01	+1.5700000E+02	+1.2432998E+02	+1.2990576E+02
79.0	15	+1.3963790E+02	+1.6845026E+01	+1.6700000E+02	+1.1753999E+02	+1.2995179E+02
80.0	20	+1.2383947E+02	+1.6267733E+01	+1.5300000E+02	+1.0700000E+02	+1.2999781E+02
81.0	24	+1.2690747E+02	+1.0661756E+01	+1.4757999E+02	+1.0400000E+02	+1.3004385E+02
82.0	20	+1.[illegible]65769[illegible]E+02	+1.0[illegible]389E+01	+1.5500000E+02	+1.2200000E+02	+1.3008987E+02
83.0	34	+1.[illegible]58945E+02	+1.3427848E+01	+1.6300000E+02	+1.1800000E+02	+1.3013591E+02
84.0	20	+1.3809289E+02	+1.1692970E+01	+1.5900000E+02	+1.2026998E+02	+1.3018193E+02
85.0	10	+1.1756790E+02	+5.0198905E+00	+1.2225999E+02	+1.0687998E+02	+1.3022796E+02
86.0	15	+1.1758126E+02	+1.3819156E+01	+1.4229998E+02	+1.0100000E+02	+1.3027400E+02
87.0	30	+1.3538789E+02	+1.0659816E+01	+1.6000000E+02	+1.2000000E+02	+1.3032002E+02
88.0	25	+1.3143026E+02	+1.0764922E+01	+1.5500999E+02	+1.0851998E+02	+1.3036605E+02
89.0	15	+1.2910520E+02	+1.[illegible]9194E+01	+1.5627999E+02	+1.1021998E+02	+1.3041207E+02
91.0	10	+1.1355987E+02	+7.6142856E+00	+1.2456999E+02	+1.0497999E+02	+1.3050415E+02
92.0	21	+1.1757519E+02	+9.6782097E+00	+1.3859999E+02	+1.0200000E+02	+1.3055017E+02
93.0	15	+1.1754457E+02	+1.0536422E+01	+1.3653999E+02	+1.0225999E+02	+1.3059620E+02
95.0	15	+1.2252999E+02	+1.7102153E+01	+1.5618998E+02	+9.7139999E+01	+1.3068826E+02
97.0	5	[illegible]	[illegible]	[illegible]	[illegible]	+1.3078031E+02
98.0	15	+1.1926983E+02	+1.3359147E+01	+1.4430999E+02	+1.0210998E+02	+1.3082635E+02
100.0	10	+1.1675993E+02	+2.3502032E+01	+1.4183999E+02	+9.2429992E+01	+1.3091841E+02
103.0	10	+1.2570390E+02	+1.1368655E+01	+1.4134999E+02	+1.1336999E+02	+1.3105648E+02
106.0	5	+1.1980995E+02	+1.0359300E+00	+1.2129998E+02	+1.1655999E+02	+1.3119458E+02
[illegible]	5	[illegible]	+[illegible]7715621E+00	+1.0558999E+02	+1.0127999E+02	+1.3128663E+02
109.0	5	+1.0022192E+02	+3.6339409E+00	+1.0583999E+02	+9.6099990E+01	+1.3133267E+02
110.0	5	+1.1192797E+02	+4.2272477E+00	+1.1767999E+02	+1.0767999E+02	+1.3137869E+02

ANB 3066 TENSILE STRESS AT RUPTURE, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

Y = ((+1.1644406E+03) + (+1.7240070E+01) * X)

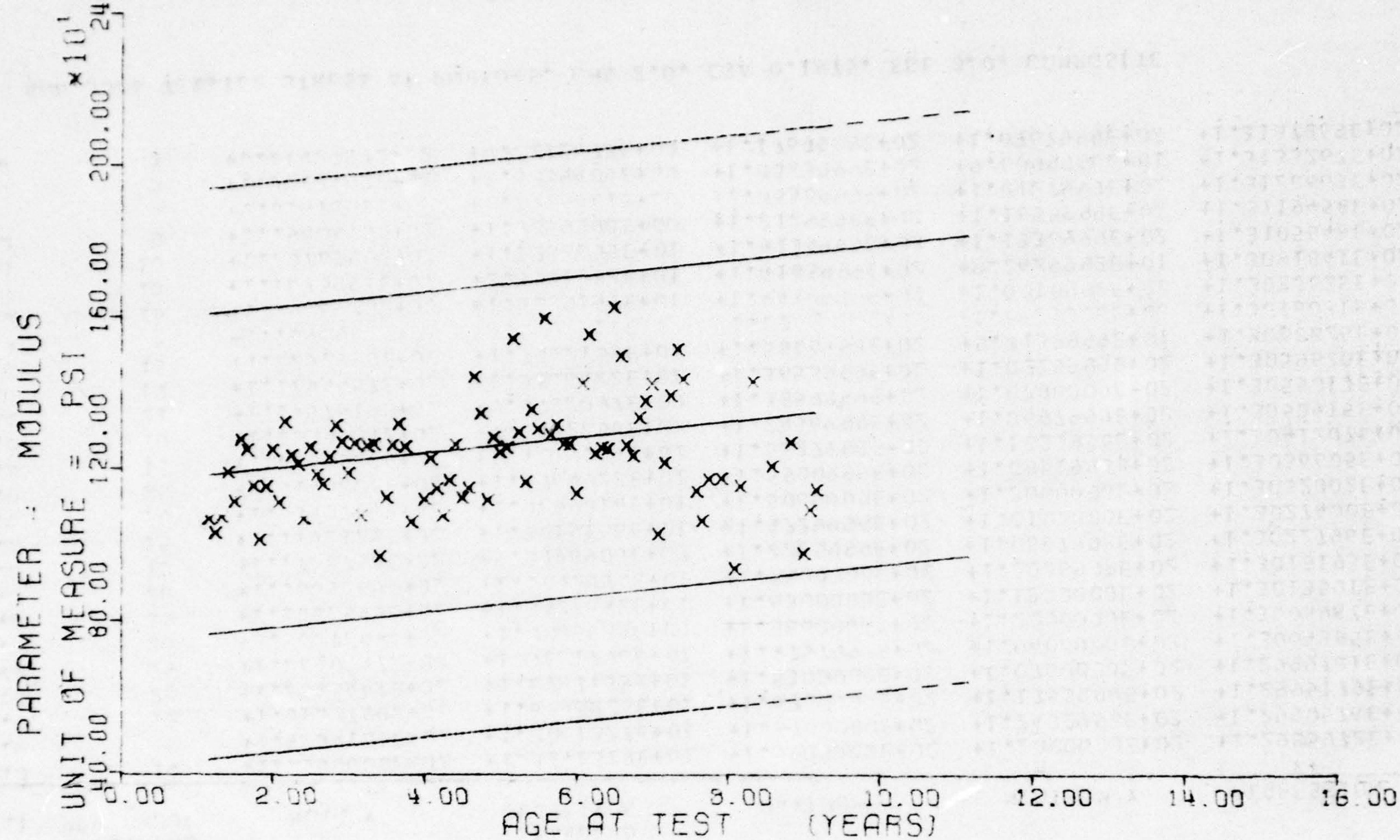
F = +4.3169372E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_y = +2.5465833E+02

R = +1.6818470E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +2.6248376E-01

t = +6.5703403E+00 SIGNIFICANCE OF t = SIGNIFICANT S_t = +2.5111548E+02

N = 1485 DEGREES OF FREEDOM = 1483

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 TENSILE MODULUS, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

Figure 5 - 4

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
14.0	10	+1.0710000E+03	+2.2521347E+02	+1.6500000E+03	+8.6000000E+02	+1.1885849E+03
15.0	10	+1.0545000E+03	+1.7988344E+02	+1.2700000E+03	+7.5500000E+02	+1.1903095E+03
16.0	15	+1.0750000E+03	+2.0524549E+02	+1.5100000E+03	+7.8000000E+02	+1.1920341E+03
17.0	15	+1.1937998E+03	+2.2470288E+02	+1.5470000E+03	+9.1600000E+02	+1.1937587E+03
18.0	5	+1.1150000E+03	+2.4068851E+02	+1.4000000E+03	+8.7000000E+02	+1.1954833E+03
19.0	20	+1.2795999E+03	+1.7057758E+02	+1.4960000E+03	+9.6000000E+02	+1.1972080E+03
20.0	25	+1.2530000E+03	+1.[illegible]293321E+02	+1.5850000E+03	+9.6200000E+02	+1.1989326E+03
21.0	33	+1.1532727E+03	+1.9108392E+02	+1.5700000E+03	+8.1700000E+02	+1.2006572E+03
22.0	10	+1.0157998E+03	+9.2786643E+01	+1.1570000E+03	+8.6500000E+02	+1.2023818E+03
23.0	15	[illegible]	+1.9747403E+02	+1.7130000E+03	+8.9000000E+02	+1.2041064E+03
24.0	35	+1.2531142E+03	+1.2962531E+02	+1.5200000E+03	+1.0120000E+03	+1.2058310E+03
25.0	25	+1.1151599E+03	+1.4766041E+02	+1.3520000E+03	+8.5500000E+02	+1.2075556E+03
26.0	25	[illegible]	[illegible]	[illegible]	+1.1390000E+03	+1.2092802E+03
27.0	25	+1.2596799E+03	+1.4534290E+02	+1.5000000E+03	+9.3100000E+02	+1.2110048E+03
28.0	10	+1.2171999E+03	+1.3853444E+02	+1.4680000E+03	+9.9100000E+02	+1.2127294E+03
29.0	10	+1.0726999E+03	+1.1877060E+02	+1.3160000E+03	+9.5100000E+02	+1.2144541E+03
30.0	15	+1.2598665E+03	+2.1857424E+02	+1.6500000E+03	+9.6300000E+02	+1.2161787E+03
31.0	10	+1.1853999E+03	+1.2[illegible]E+02	+1.3890000E+03	+1.0200000E+03	+1.2179033E+03
32.0	40	[illegible]	+2.0716995E+02	+1.5380000E+03	+7.7000000E+02	+1.2196279E+03
33.0	20	+1.2326499E+03	+1.8291550E+02	+1.6000000E+03	+9.3200000E+02	+1.2213525E+03
34.0	10	+1.3173999E+03	+1.5043507E+02	+1.5100000E+03	+1.0990000E+03	+1.2230771E+03
35.0	25	+1.2733998E+03	+2.46[illegible]E+02	+1.8390000E+03	+8.2300000E+02	+1.2248017E+03
36.0	25	+1.1916398E+03	+2.3039501E+02	+1.8300000E+03	+9.0000000E+02	+1.2265263E+03
37.0	30	+1.2395332E+03	+3.0431253E+02	+2.1900000E+03	+9.2000000E+02	+1.2282509E+03
38.0	10	+1.0616999E+03	+1.7809833E+02	+1.4140000E+03	+8.8000000E+02	+1.2299755E+03
39.0	5	+1.2550000E+03	+1.7999444E+02	+1.5150000E+03	+1.0280000E+03	+1.2317001E+03
40.0	10	+1.2700000E+03	+1.9246933E+02	+1.5900000E+03	+1.0600000E+03	+1.2334248E+03
41.0	5	+9.7400000E+02	+4.0375[illegible]E+01	+1.0130000E+03	+9.1000000E+02	+1.2351494E+03
42.0	10	+1.1236999E+03	+1.3474283E+02	+1.4270000E+03	+9.0600000E+02	+1.2368740E+03
43.0	20	+1.2875000E+03	+1.4595655E+02	+1.5430000E+03	+9.5000000E+02	+1.2385986E+03
44.0	15	+1.3220665E+03	+3.2552943E+02	+2.1400000E+03	+1.0150000E+03	+1.2403232E+03

A[illegible] TENSILE MODULUS, CHS 2.0, CSA 0.1875, EGL 3.0, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
45.0	20	+1.2626499E+03	+1.1449007E+02	+1.4860000E+03	+1.0750000E+03	+1.2420476E+03
46.0	10	+1.0655000E+03	+6.7774544E+01	+1.1700000E+03	+9.9200000E+02	+1.2437724E+03
48.0	10	+1.1245000E+03	+1.6361763E+02	+1.5360000E+03	+9.8000000E+02	+1.2472216E+03
49.0	15	+1.2508664E+03	+1.9624123E+02	+1.5440000E+03	+1.0400000E+03	+1.2489462E+03
50.0	21	+1.1555532E+03	+1.6352136E+02	+1.6000000E+03	+9.5000000E+02	+1.2506708E+03
51.0	10	+1.0612998E+03	+1.3659617E+02	+1.2760000E+03	+8.9000000E+02	+1.2523955E+03
52.0	21	+1.1741422E+03	+1.3573752E+02	+1.4000000E+03	+9.8000000E+02	+1.2541201E+03
53.0	10	+1.2635999E+03	+5.4332719E+01	+1.3560000E+03	+1.1900000E+03	+1.2558447E+03
54.0	10	[illegible]	+7.[illegible]47E+01	+1.2800000E+03	+1.0480000E+03	+1.2575693E+03
55.0	13	+1.1539228E+03	+2.3258441E+02	+1.8050000E+03	+7.8500000E+02	+1.2592939E+03
56.0	15	+1.4450000E+03	+3.6225523E+02	+2.1000000E+03	+1.0570000E+03	+1.2610185E+03
57.0	10	+1.3493999E+03	+3.5404722E+02	+1.7240000E+03	+8.5000000E+02	+1.2627431E+03
58.0	15	[illegible]	+1.23[illegible]E+02	[illegible]	+9.8400000E+02	+1.2644677E+03
59.0	26	+1.2673307E+03	+1.7203891E+02	+1.[illegible]E+03	+1.0200000E+03	+1.2661923E+03
60.0	10	+1.2431999E+03	+7.4406968E+01	+1.3270000E+03	+1.0750000E+03	+1.2679169E+03
61.0	15	+1.2213999E+03	+1.6501038E+02	+1.5390000E+03	+9.9300000E+02	+1.2696416E+03
62.0	10	+1.5485000E+03	+4.4035517E+02	+2.3460000E+03	+1.1240000E+03	+1.2713662E+03
63.0	25	+1.3024799E+03	+1.7757750E+02	+1.7[illegible]E+03	+1.0160000E+03	+1.2730908E+03
64.0	5	+1.1710000E+03	+5.9025418E+01	+1.2210000E+03	+1.0840000E+03	+1.2748154E+03
65.0	20	+1.3017500E+03	+2.1645599E+02	+1.7300000E+03	+1.0600000E+03	+1.2765400E+03
66.0	28	+1.3102856E+03	+1.7912190E+02	+1.6380000E+03	+9.6600000E+02	+1.2782646E+03
67.0	33	+1.3[illegible]74[illegible]E+03	+3.7481433E+02	+2.2840000E+03	+1.0750000E+03	+1.2799892E+03
68.0	33	+1.2943937E+03	+1.5252781E+02	+1.5750000E+03	+1.0080000E+03	+1.2817138E+03
69.0	30	+1.3147331E+03	+1.4221608E+02	+1.7150000E+03	+9.9300000E+02	+1.2834384E+03
70.0	33	+1.2837999E+03	+2.1593347E+02	+1.9850000E+03	+9.8000000E+02	+1.2851630E+03
71.0	35	+1.2591142E+03	+2.9016191E+02	+2.1000000E+03	+8.2000000E+02	+1.2868876E+03
72.0	5	+1.1430000E+03	+3.3175723E+01	+1.1730000E+03	+1.1040000E+03	+1.2886123E+03
73.0	20	+1.4274499E+03	+3.3652574E+02	+2.1170000E+03	+1.0100000E+03	+1.2903369E+03
74.0	15	+1.5570000E+03	+2.5025080E+02	+2.0800000E+03	+1.0800000E+03	+1.2920615E+03
75.0	33	+1.2452727E+03	+2.1233390E+02	+1.9040000E+03	+1.0400000E+03	+1.2937861E+03
76.0	24	+1.2500000E+03	+1.3670772E+02	+1.5730000E+03	+9.8000000E+02	+1.2955107E+03

[illegible] 4000 TENSILE [illegible] 0.1875, [illegible] 3.0, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
77.0	14	+1.2565712E+03	+3.1009019E+02	+1.3800000E+03	+8.3000000E+02	+1.2972353E+03
78.0	9	+1.5511110E+03	+3.2857740E+02	+2.1040000E+03	+1.2390000E+03	+1.2989599E+03
79.0	15	+1.5620000E+03	+2.3490048E+02	+1.9810000E+03	+1.1880000E+03	+1.3006845E+03
80.0	20	+1.2671499E+03	+3.9152882E+02	+2.2010000E+03	+8.7000000E+02	+1.3024091E+03
81.0	24	+1.2588332E+03	+2.0876107E+02	+1.7800000E+03	+8.6000000E+02	+1.3041337E+03
82.0	20	+1.3388999E+03	+2.4079952E+02	+1.9910000E+03	+1.0600000E+03	+1.3058583E+03
83.0	34	+1.5631174E+03	+3.20[illegible]E+02	+2.1340000E+03	+9.6000000E+02	+1.3075830E+03
84.0	20	+1.4235498E+03	+2.0425393E+02	+1.8200000E+03	+1.0910000E+03	+1.3093076E+03
85.0	10	+1.0330000E+03	+2.992[illegible]E+01	+1.0770000E+03	+9.9000000E+02	+1.3110322E+03
[illegible]	[illegible]	[illegible]	+2.2904158E+02	+1.[illegible]E+03	+9.6000000E+02	+1.3127568E+03
87.0	30	+1.5970332E+03	+2.9027226E+02	+2.1000000E+03	+9.2500000E+02	+1.3144814E+03
88.0	25	+1.5190000E+03	+2.9450120E+02	+1.9850000E+03	+1.0060000E+03	+1.3162060E+03
[illegible]	15	[illegible]	+1.7[illegible]E+02	+1.5170000E+03	+1.0940000E+03	+1.3179306E+03
91.0	10	+1.1461999E+03	+4.3276372E+01	+1.2450000E+03	+1.0880000E+03	+1.3213798E+03
92.0	21	+1.0870000E+03	+1.5072673E+02	+1.4580000E+03	+8.8600000E+02	+1.3231044E+03
93.0	15	+1.1757998E+03	+2.5470072E+02	+1.7350000E+03	+9.0000000E+02	+1.3248291E+03
95.0	15	+1.1793332E+03	+2.52[illegible]42E+02	+1.8500000E+03	+8.6900000E+02	+1.3282783E+03
97.0	5	+9.4259990E+02	+3.3797928E+01	+9.7800000E+02	+8.9700000E+02	+1.3317275E+03
98.0	15	+1.1590000E+03	+2.[illegible]51E+02	+1.3330000E+03	+8.0800000E+02	+1.3334521E+03
100.0	10	+1.4537998E+03	+4.8154007E+02	+2.1440000E+03	+9.4200000E+02	+1.3369013E+03
103.0	10	+1.2107998E+03	+1.4004289E+02	+1.4360000E+03	+1.0210000E+03	+1.3420751E+03
106.0	5	+1.2727998E+03	+8.5203073E+01	+1.3460000E+03	+1.1300000E+03	+1.3472490E+03
108.0	5	+9.8119995E+02	+6.0495454E+01	+1.0600000E+03	+9.0800000E+02	+1.3506982E+03
109.0	5	+1.0550000E+03	+8.3806324E+01	+1.1730000E+03	+9.6600000E+02	+1.3524226E+03
110.0	5	+1.1491999E+03	+5.7159428E+01	+1.2050000E+03	+1.0570000E+03	+1.3541472E+03

[illegible] TENSILE MODULUS, CHS 2.0, CSA 0.1575, EGL 3.0, COMPOSITE

SECTION VI

VERY LOW RATE TENSILE

This test used a 1/2" JANNAF dogbone. The specimens were tested at a crosshead speed of 2×10^{-4} in/min.

Regression analyses of the "worst lots" using a single tailed "t" test show that there is a statistically significant decrease in strain and statistically significant increase in stress and modulus (Figures 6-1 through 6-5).

Data from all lot testing shows a statistically significant increase in strains and maximum stress (Table 2-1) with intercepts similar to those of the last report [MANCP 298 (74)].

Very low rate tensile testing is related to strain capability under storage conditions. The "worst lots" show a much greater strain capability than the alert limit of 4.9% at 60°F. No ageout is predicted for the next two years beyond the oldest data point.

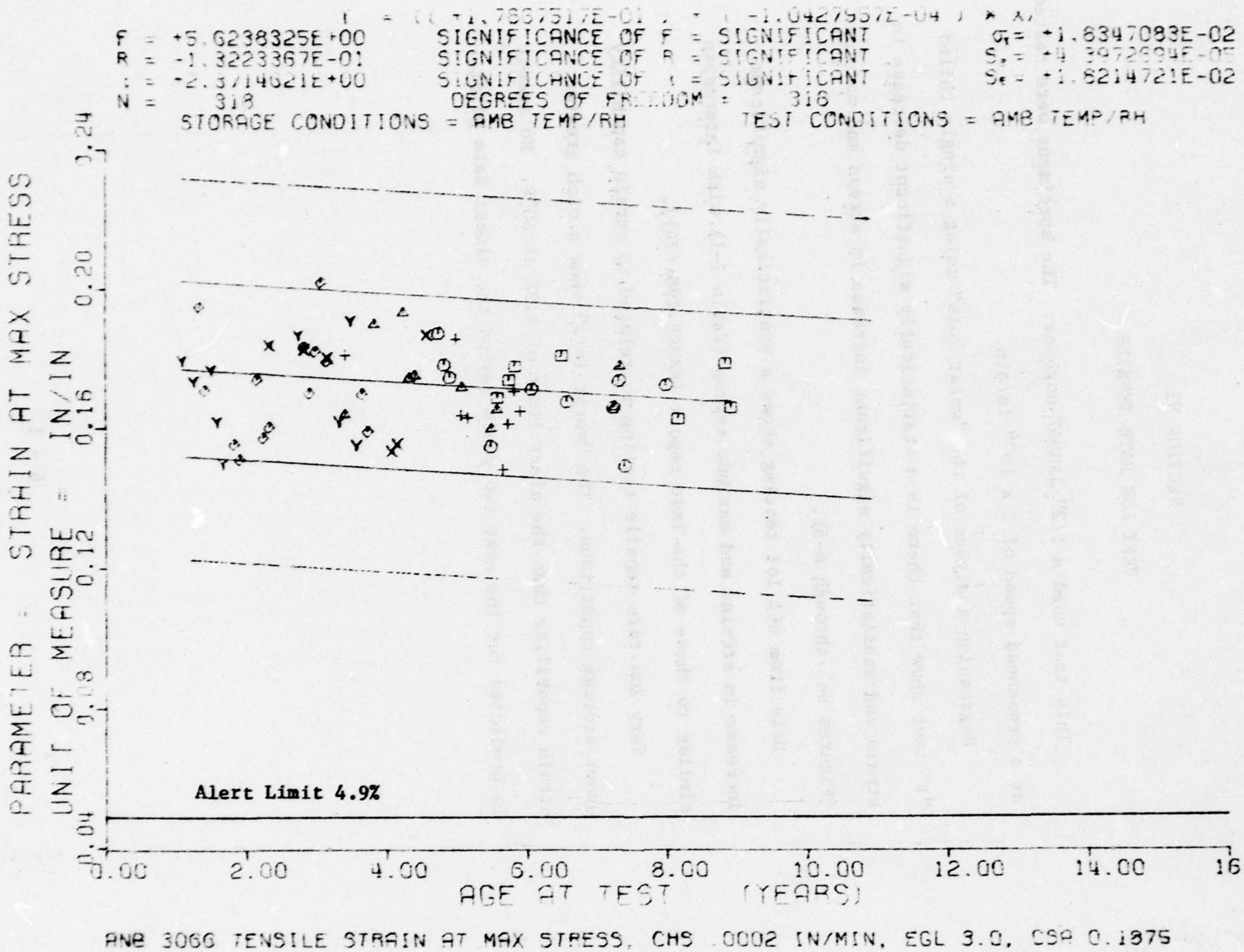

Y = ((+1.7867517E-01) + (-1.0427957E-04) * X)
F = +5.6238325E+00 SIGNIFICANCE OF F = SIGNIFICANT σT = +1.8347083E-02
R = -1.3223367E-01 SIGNIFICANCE OF R = SIGNIFICANT
T = +2.3714621E+00 SIGNIFICANCE OF T = SIGNIFICANT Se = +1.8214721E-02
N = 318 DEGREES OF FREEDOM = 316
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.04
0.08
0.12
0.16
0.20
0.24
Alert Limit 4.9%
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
ANB 3066 TENSILE STRAIN AT MAX STRESS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

Figure 6 - 1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	5	+1.7959994E-01	+1.1348527E-02	+1.9199997E-01	+1.6399997E-01	+1.7731952E-01
15.0	10	+1.7349976E-01	+1.8241986E-02	+1.9799995E-01	+1.4799994E-01	+1.7711097E-01
16.0	15	+1.9506645E-01	+1.2647983E-02	+2.1199995E-01	+1.7399996E-01	+1.7700666E-01
17.0	10	+1.7099970E-01	+1.1287662E-02	+1.8799996E-01	+1.4399999E-01	+1.7690241E-01
18.0	5	+1.7679995E-01	+1.4462867E-02	+1.8999998E-01	+1.5599995E-01	+1.7679810E-01
19.0	5	+1.6199994E-01	+2.3706380E-02	+1.9399994E-01	+1.3599997E-01	+1.7669385E-01
20.0	5	+1.4999991E-01	+9.8990669E-03	+1.6599994E-01	+1.3999998E-01	+1.7658954E-01
22.0	5	+1.5559995E-01	+1.4518603E-02	+1.6599994E-01	+1.2999999E-01	+1.7638099E-01
23.0	5	+1.5119993E-01	+3.8969110E-03	+1.5599995E-01	+1.4599996E-01	+1.7627674E-01
26.0	2	+1.7399996E-01	+2.8282427E-03	+1.7599999E-01	+1.7199999E-01	+1.7596387E-01
27.0	3	+1.5733325E-01	+1.4468483E-02	+1.7399996E-01	+1.4799994E-01	+1.7585963E-01
28.0	15	+1.7613297E-01	+1.7396592E-02	+2.0599997E-01	+1.4799994E-01	+1.7575532E-01
33.0	5	+1.8683993E-01	+1.3548405E-02	+2.0629996E-01	+1.7349994E-01	+1.7523390E-01
34.0	7	+1.8301415E-01	+1.6118768E-02	+2.0599997E-01	+1.5599995E-01	+1.7512965E-01
35.0	3	+1.7009997E-01	+1.8993641E-02	+1.8709999E-01	+1.4959996E-01	+1.7502534E-01
36.0	10	+1.8220973E-01	+2.1842007E-02	+2.1009999E-01	+1.5599995E-01	+1.7492109E-01
37.0	1	+2.0199996E-01	+0.0000000E+03	+2.0199996E-01	+2.0199996E-01	+1.7481678E-01
38.0	14	+1.8007820E-01	+1.7376536E-02	+2.0599997E-01	+1.4999997E-01	+1.7471253E-01
40.0	5	+1.6199994E-01	+1.5272626E-02	+1.8239998E-01	+1.4559996E-01	+1.7450398E-01
41.0	8	+1.7474973E-01	+1.3732561E-02	+1.8399995E-01	+1.4199995E-01	+1.7439967E-01
42.0	3	+1.9086664E-01	+1.8524922E-03	+1.9299995E-01	+1.8959999E-01	+1.7429542E-01
43.0	1	+1.5519994E-01	+0.0000000E+23	+1.5519994E-01	+1.5519994E-01	+1.7419111E-01
44.0	4	+1.6989994E-01	+2.5119162E-02	+1.9199997E-01	+1.3399994E-01	+1.7408686E-01
45.0	1	+1.5919995E-01	+0.0000000E+31	+1.5919995E-01	+1.5919995E-01	+1.7398256E-01
46.0	13	+1.8992269E-01	+2.4018074E-02	+2.2999995E-01	+1.5699994E-01	+1.7387831E-01
49.0	3	+1.5356659E-01	+1.8652579E-02	+1.7359995E-01	+1.3669997E-01	+1.7356544E-01
50.0	2	+1.5559995E-01	+1.8667795E-02	+1.6879999E-01	+1.4239996E-01	+1.7346119E-01
51.0	5	+1.9319993E-01	+1.3754288E-02	+2.1399998E-01	+1.8199998E-01	+1.7335689E-01
52.0	4	+1.7449998E-01	+4.4340983E-03	+1.7799997E-01	+1.6799998E-01	+1.7325258E-01
53.0	16	+1.7512470E-01	+1.2777470E-02	+1.8999999E-01	+1.3999998E-01	+1.7314833E-01
55.0	4	+1.8694990E-01	+1.7251877E-02	+2.0799994E-01	+1.6639995E-01	+1.7293977E-01

ANB 3066 TENSILE MAXIMUM STRESS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

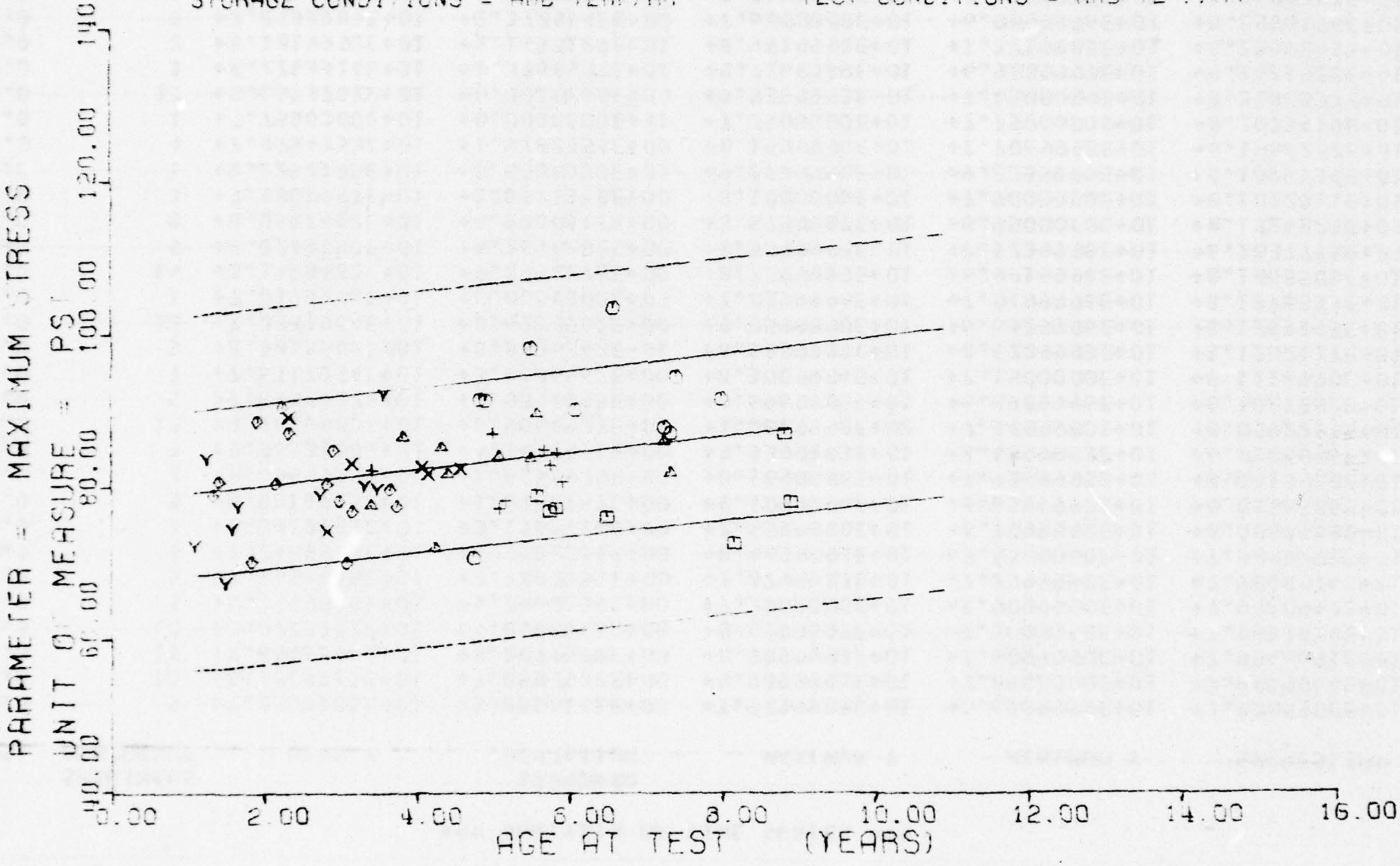
AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
57.0	3	+1.8733328E-01	+8.0822189E-03	+1.9599997E-01	+1.7999994E-01	+1.7273122E-01
58.0	6	+1.7833328E-01	+1.6561083E-02	+2.0399999E-01	+1.6199994E-01	+1.7262691E-01
59.0	6	+1.7466652E-01	+1.1431960E-02	+1.8199998E-01	+1.5799999E-01	+1.7252266E-01
60.0	6	+1.8566656E-01	+1.5306515E-02	+2.0999997E-01	+1.7199999E-01	+1.7241835E-01
61.0	16	+1.6570605E-01	+1.3975054E-02	+1.8239998E-01	+1.4079999E-01	+1.7231410E-01
62.0	2	+1.5299992E-01	+4.2453998E-03	+1.6599994E-01	+1.5999996E-01	+1.7220979E-01
66.0	10	+1.5727772E-01	+1.5759438E-02	+1.8799996E-01	+1.3199996E-01	+1.7179268E-01
67.0	12	+1.6693305E-01	+1.2092647E-02	+1.8799996E-01	+1.4799994E-01	+1.7168843E-01
68.0	4	+1.4809995E-01	+1.3447817E-02	+1.6639995E-01	+1.3399994E-01	+1.7158412E-01
69.0	9	+1.5964411E-01	+9.7538077E-03	+1.8399995E-01	+1.5899997E-01	+1.7147988E-01
70.0	6	+1.7415550E-01	+7.6552085E-03	+1.8799996E-01	+1.6799998E-01	+1.7137557E-01
71.0	1	+1.6479998E-01	+0.0000000E+07	+1.6479998E-01	+1.6479998E-01	+1.7127132E-01
73.0	5	+1.7119997E-01	+9.8587332E-03	+1.8199998E-01	+1.5599995E-01	+1.7106276E-01
78.0	5	+1.8079996E-01	+1.2213711E-02	+1.9599997E-01	+1.6999995E-01	+1.7054134E-01
79.0	5	+1.6759991E-01	+1.3667053E-02	+1.8599998E-01	+1.5599995E-01	+1.7043703E-01
87.0	3	+1.6599994E-01	+3.4402234E-05	+1.6599994E-01	+1.6599994E-01	+1.6960281E-01
88.0	9	+1.7458868E-01	+2.3202676E-02	+2.0639997E-01	+1.4239996E-01	+1.6949856E-01
89.0	2	+1.4919996E-01	+3.5638463E-02	+1.7439997E-01	+1.2399995E-01	+1.6939425E-01
96.0	5	+1.7239993E-01	+1.7766776E-02	+1.9199997E-01	+1.5039998E-01	+1.6866433E-01
98.0	5	+1.6269993E-01	+3.0687283E-03	+1.6799998E-01	+1.5999996E-01	+1.6845577E-01
106.0	2	+1.7849993E-01	+4.4547935E-02	+2.0999997E-01	+1.4699995E-01	+1.6762149E-01
107.0	2	+1.6579991E-01	+3.3756662E-04	+1.6599994E-01	+1.6559994E-01	+1.6751724E-01

ANB 3066 TENSILE MAXIMUM STRESS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

Y = ((+7.8152654E+01) + (+8.7127914E-02) × X)

F = +2.1725698E+01	SIGNIFICANCE OF F = SIGNIFICANT		σ_Y = +7.9921260E+00
R = +2.5363245E-01	SIGNIFICANCE OF R = SIGNIFICANT		S_b = +1.8692631E-02
t = +4.6610834E+00	SIGNIFICANCE OF t = SIGNIFICANT		S_e = +7.7430114E+00
N = 318	DEGREES OF FREEDOM = 316		

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 TENSILE MAXIMUM STRESS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

Figure 6 - 2

****** LINEAR REGRESSION ANALYSIS ******

***** ANALYSIS OF TIME SERIES *****

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	5	+7.2339935E+01	+3.8506141E+00	+7.7299987E+01	+6.6599990E+01	+7.9285308E+01
15.0	10	+8.3819915E+01	+3.8597922E+00	+9.0399993E+01	+7.8500000E+01	+7.9459564E+01
16.0	15	+7.8946594E+01	+5.2078699E+00	+8.9899993E+01	+7.4099990E+01	+7.9546691E+01
17.0	10	+8.0779907E+01	+4.8688915E+00	+8.8299987E+01	+7.3099990E+01	+7.9633819E+01
18.0	5	+6.7479980E+01	+5.7492239E+00	+7.2500000E+01	+5.9099990E+01	+7.9720947E+01
19.0	5	+7.4619918E+01	+2.7898555E+00	+7.8799987E+01	+7.2599990E+01	+7.9808074E+01
20.0	5	+7.7499938E+01	+4.2582281E+00	+8.4899993E+01	+7.4500000E+01	+7.9895202E+01
22.0	5	+7.0319961E+01	+3.1365726E+00	+7.4599990E+01	+6.7099990E+01	+8.0069458E+01
23.0	5	+8.8813315E+01	+1.9780267E+00	+9.1099990E+01	+8.6599990E+01	+8.0156585E+01
26.0	2	+8.0549987E+01	+1.6255979E+00	+8.1699996E+01	+7.9399993E+01	+8.0417968E+01
27.0	3	+9.0633300E+01	+4.3437451E+00	+9.5399993E+01	+8.6899993E+01	+8.0505096E+01
28.0	15	+8.8666580E+01	+6.9666927E+00	+1.0629998E+02	+7.5599990E+01	+8.0592224E+01
33.0	5	+7.8937927E+01	+7.0398693E+00	+8.6969985E+01	+6.8089996E+01	+8.1027862E+01
34.0	7	+7.6117034E+01	+3.8086942E+00	+8.3009994E+01	+7.1500000E+01	+8.1114990E+01
35.0	3	+8.5015662E+01	+8.0806242E-01	+8.5889999E+01	+8.4289993E+01	+8.1202117E+01
36.0	10	+7.8339904E+01	+8.4238562E+00	+9.0599990E+01	+6.6329986E+01	+8.1289245E+01
37.0	1	+7.0199996E+01	+0.0000000E+03	+7.0199996E+01	+7.0199996E+01	+8.1376373E+01
38.0	14	+8.1428482E+01	+4.5852176E+00	+8.7399993E+01	+6.9919998E+01	+8.1463500E+01
40.0	5	+8.0239990E+01	+4.2656282E+00	+8.5399993E+01	+7.5239990E+01	+8.1637756E+01
41.0	8	+8.0537402E+01	+4.9000817E+00	+8.5799987E+01	+6.9500000E+01	+8.1724884E+01
42.0	3	+7.9809997E+01	+1.0521318E+00	+8.1000000E+01	+7.9000000E+01	+8.1812011E+01
43.0	1	+9.2239990E+01	+0.0000000E+23	+9.2239990E+01	+9.2239990E+01	+8.1899139E+01
44.0	4	+7.9754953E+01	+1.9187355E+00	+8.1599990E+01	+7.7069992E+01	+8.1986282E+01
45.0	1	+7.7500000E+01	+0.0000000E+31	+7.7500000E+01	+7.7500000E+01	+8.2073410E+01
46.0	13	+8.6653762E+01	+6.0026764E+00	+9.3399993E+01	+7.4500000E+01	+8.2160537E+01
49.0	3	+8.2743316E+01	+1.3766407E+01	+9.7269989E+01	+6.9889999E+01	+8.2421920E+01
50.0	2	+8.1819992E+01	+1.1455129E+01	+8.9919998E+01	+7.3719985E+01	+8.2509048E+01
51.0	5	+7.2139984E+01	+2.3725142E+00	+7.6000000E+01	+6.9699996E+01	+8.2596176E+01
52.0	4	+8.5324951E+01	+2.8388516E+00	+8.8399993E+01	+8.2399993E+01	+8.2683303E+01
53.0	16	+8.1818634E+01	+5.7129414E+00	+9.4500000E+01	+7.6299987E+01	+8.2770431E+01
55.0	4	+8.2574951E+01	+4.2825800E+00	+8.6959991E+01	+7.7339996E+01	+8.2944686E+01

ANB 3066 TENSILE MAXIMUM STRESS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
57.0	3	+7.0799987E+01	+7.9266812E-01	+7.1699996E+01	+7.0199996E+01	+8.3118942E+01
58.0	6	+9.1599384E+01	+3.0661470E+00	+9.5000000E+01	+8.8199996E+01	+8.3206069E+01
59.0	6	+9.1449905E+01	+3.0094523E+00	+9.6199996E+01	+8.8099990E+01	+8.3293197E+01
60.0	6	+8.7133209E+01	+6.3858168E+00	+9.2299987E+01	+7.5199996E+01	+8.3380325E+01
61.0	16	+7.8924270E+01	+6.5420541E+00	+8.8899993E+01	+6.6489990E+01	+8.3467453E+01
62.0	2	+7.8199996E+01	+2.1207350E+00	+7.9699996E+01	+7.6699996E+01	+8.3554580E+01
66.0	10	+9.1012908E+01	+8.7879681E+00	+1.0389999E+02	+7.8679992E+01	+8.3903091E+01
67.0	12	+8.4299942E+01	+6.5338421E+00	+9.5699996E+01	+7.5500000E+01	+8.3990219E+01
68.0	4	+8.5052490E+01	+1.5937208E+00	+8.6489990E+01	+8.3009994E+01	+8.4077346E+01
69.0	9	+7.8909327E+01	+4.0731418E+00	+8.5000000E+01	+7.0599990E+01	+8.4164474E+01
70.0	6	+8.0973297E+01	+4.5443049E+00	+8.6000000E+01	+7.4699996E+01	+8.4251602E+01
71.0	1	+8.0739990E+01	+0.0000000E+07	+8.0739990E+01	+8.0739990E+01	+8.4338729E+01
73.0	5	+9.0179931E+01	+2.3928828E+00	+9.2699996E+01	+8.7500000E+01	+8.4512985E+01
78.0	5	+7.6059951E+01	+1.5500749E+00	+7.8199996E+01	+7.4599990E+01	+8.4948623E+01
79.0	5	+1.0351991E+02	+2.6008922E+00	+1.0729998E+02	+1.0079998E+02	+8.5035751E+01
87.0	3	+8.6633300E+01	+1.4865795E+00	+8.7899993E+01	+8.5000000E+01	+8.5732772E+01
88.0	9	+8.5941040E+01	+5.7943156E+00	+9.7519989E+01	+7.7939987E+01	+8.5819900E+01
89.0	2	+9.4524978E+01	+1.1401912E+00	+9.5329986E+01	+9.3719985E+01	+8.5907028E+01
96.0	5	+9.1609954E+01	+4.0274052E+00	+9.6500000E+01	+8.6939987E+01	+8.6516921E+01
98.0	5	+7.2595947E+01	+2.5707572E+00	+7.6039993E+01	+6.9199996E+01	+8.6691177E+01
106.0	2	+8.7000000E+01	+9.8994949E+00	+9.4000000E+01	+8.0000000E+01	+8.7388198E+01
107.0	2	+7.7999984E+01	+8.4689085E-01	+7.8599990E+01	+7.7399993E+01	+8.7475326E+01

AND 3066 TENSILE MAXIMUM STRESS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

Y = ((+1.8383412E-01) + (-1.1620938E-04) * X)

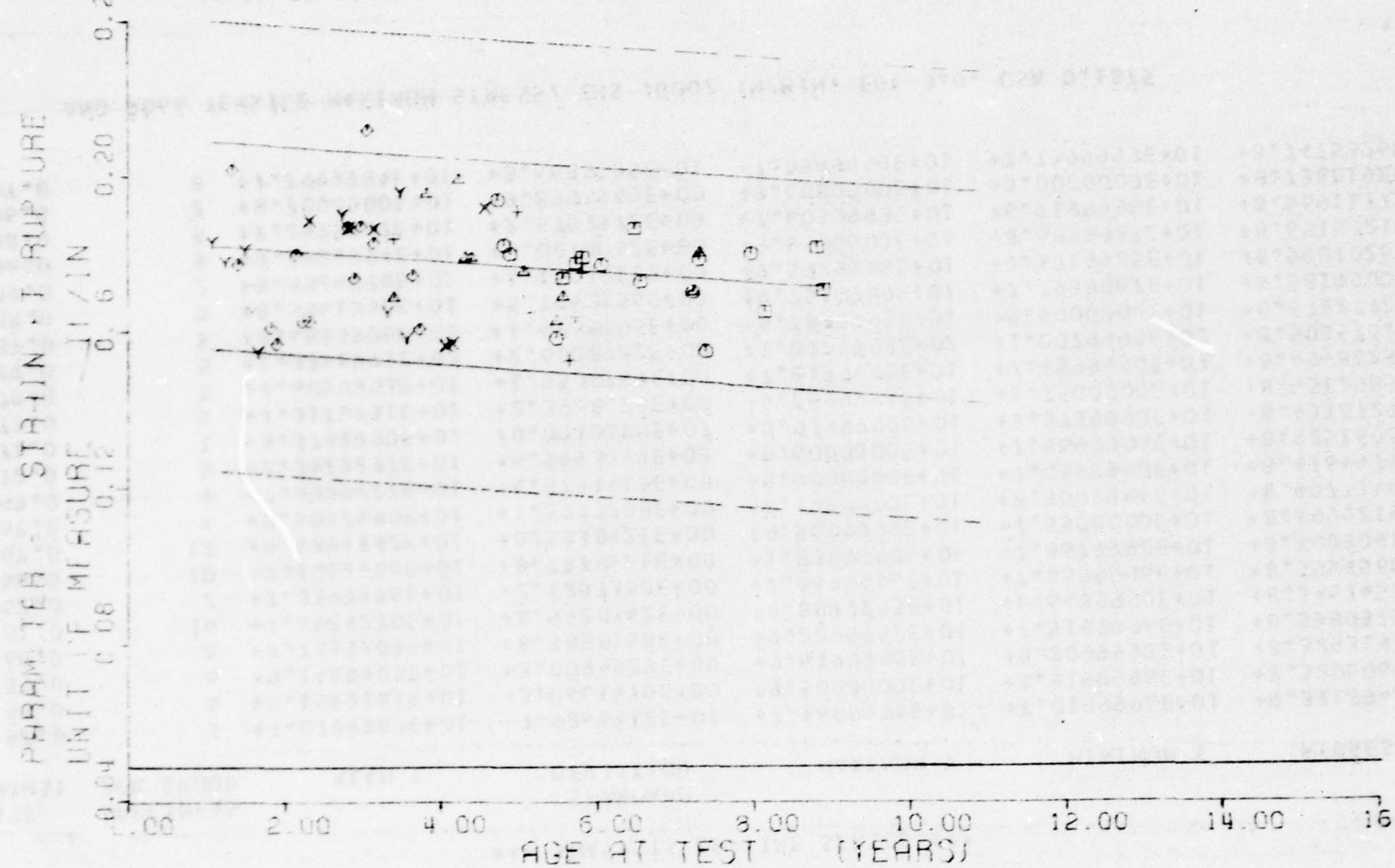
F = +6.2293536E+00 SIGNIFICANCE OF F = SIGNIFICANT $\bar{Y}$ = +1.9445193E-02

R = -1.3903973E-01 SIGNIFICANCE OF R = SIGNIFICANT S_b = +4.6560723E-05

t = +2.4958673E+00 SIGNIFICANCE OF t = SIGNIFICANT S_e = +1.9286756E-02

N = 318 DEGREES OF FREEDOM = 316

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



ANB 3066 TENSILE STRAIN AT RUPTURE, CHS .0002 IN/MIN, EGL 3.0, CSH 0.1875

Figure 6 - 3

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	5	+1.8319994E-01	+1.0731984E-02	+1.9399994E-01	+1.6999995E-01	+1.8232339E-01
15.0	10	+1.7799967E-01	+1.9795903E-02	+2.0599997E-01	+1.5199995E-01	+1.8209093E-01
16.0	15	+2.0179969E-01	+1.4226970E-02	+2.2399997E-01	+1.7899996E-01	+1.8197476E-01
17.0	10	+1.7739969E-01	+1.1240386E-02	+1.9399994E-01	+1.4999997E-01	+1.8185853E-01
18.0	5	+1.6119996E-01	+1.3827071E-02	+1.9399994E-01	+1.5999996E-01	+1.8174231E-01
19.0	5	+1.6519993E-01	+2.3392135E-02	+1.9599997E-01	+1.3999998E-01	+1.8162614E-01
20.0	5	+1.5479993E-01	+1.0059649E-02	+1.7199999E-01	+1.4599996E-01	+1.8150991E-01
22.0	5	+1.6119992E-01	+1.5465868E-02	+1.7199999E-01	+1.3399994E-01	+1.8127751E-01
23.0	5	+1.5699994E-01	+3.3157719E-03	+1.6199994E-01	+1.5299999E-01	+1.8116128E-01
26.0	2	+1.7999994E-01	+5.6558315E-03	+1.8399995E-01	+1.7599999E-01	+1.8081265E-01
27.0	3	+1.6266561E-01	+1.5010859E-02	+1.7999994E-01	+1.5399998E-01	+1.8069642E-01
28.0	15	+1.8013298E-01	+1.8278059E-02	+2.0999997E-01	+1.4799994E-01	+1.8058025E-01
33.0	5	+1.9019991E-01	+1.3475431E-02	+2.0869994E-01	+1.7749994E-01	+1.7999917E-01
34.0	7	+1.6659984E-01	+1.7535604E-02	+2.1199995E-01	+1.5799999E-01	+1.7988300E-01
35.0	3	+1.7383331E-01	+1.9585541E-02	+1.9269996E-01	+1.5359997E-01	+1.7976677E-01
36.0	10	+1.8716979E-01	+2.3642415E-02	+2.1409994E-01	+1.5919995E-01	+1.7965054E-01
37.0	1	+2.1199995E-01	+0.0000000E+79	+2.1199995E-01	+2.1199995E-01	+1.7953437E-01
38.0	14	+1.8553531E-01	+1.7878312E-02	+2.1399998E-01	+1.6299998E-01	+1.7941814E-01
40.0	5	[illegible]	[illegible]	+1.8559998E-01	+1.4799994E-01	+1.7918574E-01
41.0	8	+1.7824983E-01	+1.2534525E-02	+1.8599998E-01	+1.4799994E-01	+1.7906951E-01
42.0	3	+1.9599992E-01	+1.9998497E-03	+1.9799995E-01	+1.9399994E-01	+1.7895328E-01
43.0	1	+1.5839999E-01	+0.0000000E+99	+1.5839999E-01	+1.5839999E-01	+1.7883712E-01
44.0	4	+1.7449998E-01	+2.7204461E-02	+1.9679999E-01	+1.3599997E-01	+1.7872089E-01
45.0	1	+1.6079998E-01	+0.0000000E+07	+1.6079998E-01	+1.6079998E-01	+1.7860466E-01
48.0	13	+1.9551499E-01	+2.5525156E-02	+2.3599994E-01	+1.5999996E-01	+1.7848849E-01
49.0	3	+1.5649992E-01	+1.9514681E-02	+1.7759996E-01	+1.3909995E-01	+1.7813980E-01
50.0	2	+1.5714997E-01	+1.8597319E-02	+1.7029994E-01	+1.4399999E-01	+1.7802363E-01
51.0	5	+1.9919997E-01	+1.3608244E-02	+2.1999996E-01	+1.8799996E-01	+1.7790740E-01
52.0	4	+1.7899996E-01	+3.4608298E-03	+1.8199998E-01	+1.7399996E-01	+1.7779117E-01
53.0	16	+1.7695719E-01	+1.3094965E-02	+1.9599997E-01	+1.4399999E-01	+1.7767500E-01
55.0	4	+1.9189995E-01	+1.9405169E-02	+2.1599996E-01	+1.6959995E-01	+1.7744255E-01

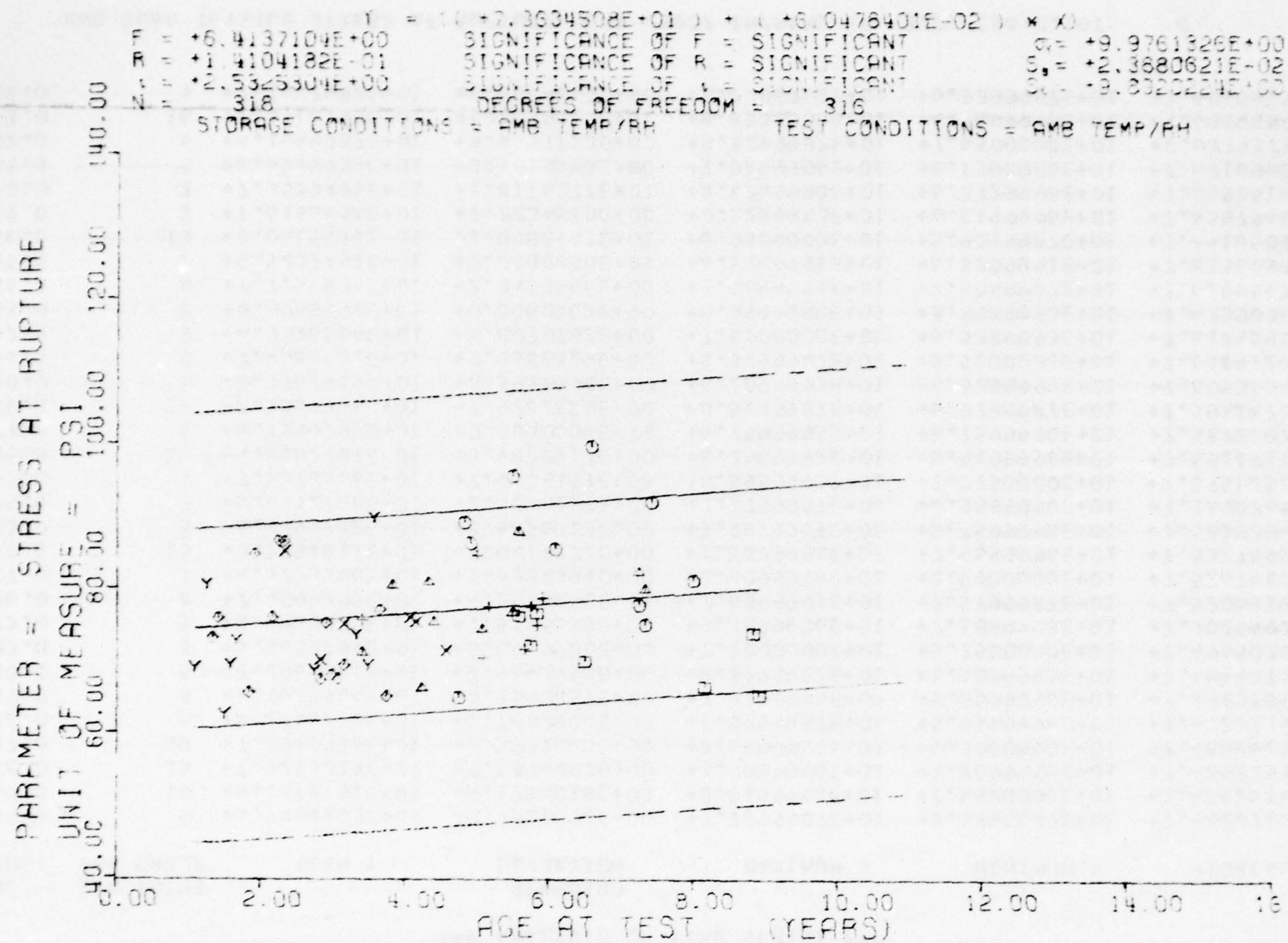
ANB 3066 TENSILE STRAIN AT RUPTURE, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
57.0	3	+1.9399994E-01	+1.1135542E-02	+2.0599997E-01	+1.8399995E-01	+1.7721015E-01
58.0	6	+1.8233329E-01	+1.7454202E-02	+2.0599997E-01	+1.6399997E-01	+1.7709392E-01
59.0	6	+1.7999982E-01	+1.3800503E-02	+1.9399994E-01	+1.6199994E-01	+1.7697775E-01
60.0	6	+1.9099980E-01	+1.5737130E-02	+2.1399998E-01	+1.7199999E-01	+1.7686152E-01
61.0	16	+1.6940086E-01	+1.4883350E-02	+1.8599998E-01	+1.4239996E-01	+1.7674529E-01
62.0	2	+1.6499996E-01	+4.2454236E-03	+1.6799998E-01	+1.6199994E-01	+1.7662912E-01
66.0	10	+1.6051977E-01	+1.8341323E-02	+1.9999998E-01	+1.3399994E-01	+1.7616426E-01
67.0	12	+1.7126637E-01	+1.2142368E-02	+1.9299995E-01	+1.5199995E-01	+1.7604804E-01
68.0	4	+1.5249997E-01	+1.4176996E-02	+1.7199999E-01	+1.3799995E-01	+1.7593187E-01
69.0	9	+1.7257750E-01	+1.1301544E-02	+1.8999999E-01	+1.5999996E-01	+1.7581564E-01
70.0	6	+1.7716558E-01	+7.9608576E-03	+1.9199997E-01	+1.6899996E-01	+1.7569941E-01
71.0	1	+1.6639995E-01	+0.0000000E+83	+1.6639995E-01	+1.6639995E-01	+1.7558324E-01
73.0	5	+1.7719995E-01	+1.1099240E-02	+1.9199997E-01	+1.6399997E-01	+1.7535078E-01
78.0	5	+1.8839993E-01	+1.0713968E-02	+1.9999998E-01	+1.7799997E-01	+1.7476975E-01
79.0	5	+1.7279994E-01	+1.5138999E-02	+1.8999999E-01	+1.5599995E-01	+1.7465353E-01
87.0	3	+1.6999995E-01	+5.6522616E-05	+1.6999995E-01	+1.6999995E-01	+1.7372387E-01
88.0	9	+1.7672190E-01	+2.5196393E-02	+2.1839994E-01	+1.4479994E-01	+1.7360764E-01
89.0	2	+1.5469996E-01	+3.9173832E-02	+1.8239998E-01	+1.2699997E-01	+1.7349147E-01
96.0	5	+1.8011993E-01	+2.4303308E-02	+2.1299999E-01	+1.5279996E-01	+1.7267799E-01
98.0	5	+1.6501992E-01	+3.6220640E-03	+1.7119997E-01	+1.6159999E-01	+1.7244559E-01
106.0	2	+1.8149995E-01	+4.4547242E-02	+2.1299999E-01	+1.4999997E-01	+1.7151588E-01
107.0	2	+1.7059993E-01	+4.8100599E-03	+1.7399996F-01	+1.6719996E-01	+1.7139971E-01

ANB 3065 TENSILE STRAIN AT RUPTURE, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875



ANB 3066 TENSILE STRESS AT RUPTURE, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

Figure 6 - 4

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	5	+6.9099945E+01	+7.2520092E+00	+7.7299987E+01	+5.8299987E+01	+7.4420715E+01
15.0	10	+8.0679931E+01	+4.1286018E+00	+8.8699996E+01	+7.5000000E+01	+7.4541671E+01
16.0	15	+7.3253219E+01	+9.5874007E+00	+8.9099990E+01	+4.7099990E+01	+7.4602157E+01
17.0	10	+7.6059936E+01	+6.3801825E+00	+8.6599990E+01	+6.3000000E+01	+7.4662628E+01
18.0	5	+6.2719970E+01	+5.7402900E+00	+7.0299987E+01	+5.5199996E+01	+7.4723114E+01
19.0	5	+6.9619964E+01	+8.1593857E+00	+7.8199996E+01	+5.6599990E+01	+7.4783584E+01
20.0	5	+7.2939941E+01	+7.9543456E+00	+8.3299987E+01	+6.3899993E+01	+7.4844070E+01
22.0	5	+6.5639984E+01	+6.0459950E+00	+7.2000000E+01	+5.7500000E+01	+7.4965026E+01
23.0	5	+8.4839935E+01	+7.5185290E+00	+9.0699996E+01	+7.1899993E+01	+7.5025497E+01
26.0	2	+7.6099990E+01	+4.2016290E-01	+7.6399993E+01	+7.5799987E+01	+7.5206939E+01
27.0	3	+8.6733306E+01	+1.5828594E+00	+8.8099990E+01	+8.5000000E+01	+7.5267410E+01
28.0	15	+8.5799911E+01	+7.0418872E+00	+1.0629998E+02	+7.4699996E+01	+7.5327896E+01
33.0	5	+6.8799942E+01	+8.4656013E+00	+7.9979995E+01	+5.7599990E+01	+7.5630294E+01
34.0	7	+6.9502746E+01	+2.9846257E+00	+7.3799987E+01	+6.5599990E+01	+7.5690765E+01
35.0	3	+7.5376563E+01	+7.4408393E+00	+8.3959991E+01	+7.0750000E+01	+7.5751251E+01
36.0	10	+6.8182907E+01	+8.4907617E+00	+8.2569992E+01	+5.5199996E+01	+7.5811721E+01
37.0	1	+6.7599990E+01	+0.0000000E+79	+6.7599990E+01	+6.7599990E+01	+7.5872207E+01
38.0	14	+7.3587066E+01	+7.9282320E+00	+8.5299987E+01	+6.0799987E+01	+7.5932678E+01
40.0	5	+7.3767959E+01	+6.5968658E+00	+8.2899993E+01	+6.5239990E+01	+7.6053634E+01
41.0	8	+7.4087402E+01	+9.9386329E+00	+8.3299987E+01	+5.5000000E+01	+7.6114120E+01
42.0	3	+6.9596564E+01	+4.8079732E+00	+7.5000000E+01	+6.5789993E+01	+7.6174591E+01
43.0	1	+8.9989990E+01	+0.0000000E+99	+8.9989990E+01	+8.9989990E+01	+7.6235076E+01
44.0	4	+7.7244934E+01	+2.9453446E+00	+7.9899993E+01	+7.3049987E+01	+7.6295547E+01
45.0	1	+6.5209991E+01	+0.0000000E+07	+6.5209991E+01	+6.5209991E+01	+7.6356033E+01
46.0	13	+8.0615341E+01	+1.0008457E+01	+8.9500000E+01	+5.9299987E+01	+7.6416503E+01
49.0	3	+7.6165556E+01	+7.2234510E+00	+8.2289993E+01	+6.8199996E+01	+7.6597946E+01
50.0	2	+7.5539993E+01	+1.8116077E+01	+8.8349990E+01	+6.2729995E+01	+7.6658416E+01
51.0	5	+6.6359954E+01	+3.4019680E+00	+7.0699996E+01	+6.1500000E+01	+7.6718902E+01
52.0	4	+8.1049987E+01	+3.6557720E+00	+8.5299987E+01	+7.6500000E+01	+7.6779373E+01
53.0	16	+7.5512390E+01	+1.1450619E+01	+8.8500000E+01	+4.7699996E+01	+7.6839859E+01
55.0	4	+7.1607482E+01	+8.0074210E+00	+8.2000000E+01	+6.3299987E+01	+7.6960815E+01

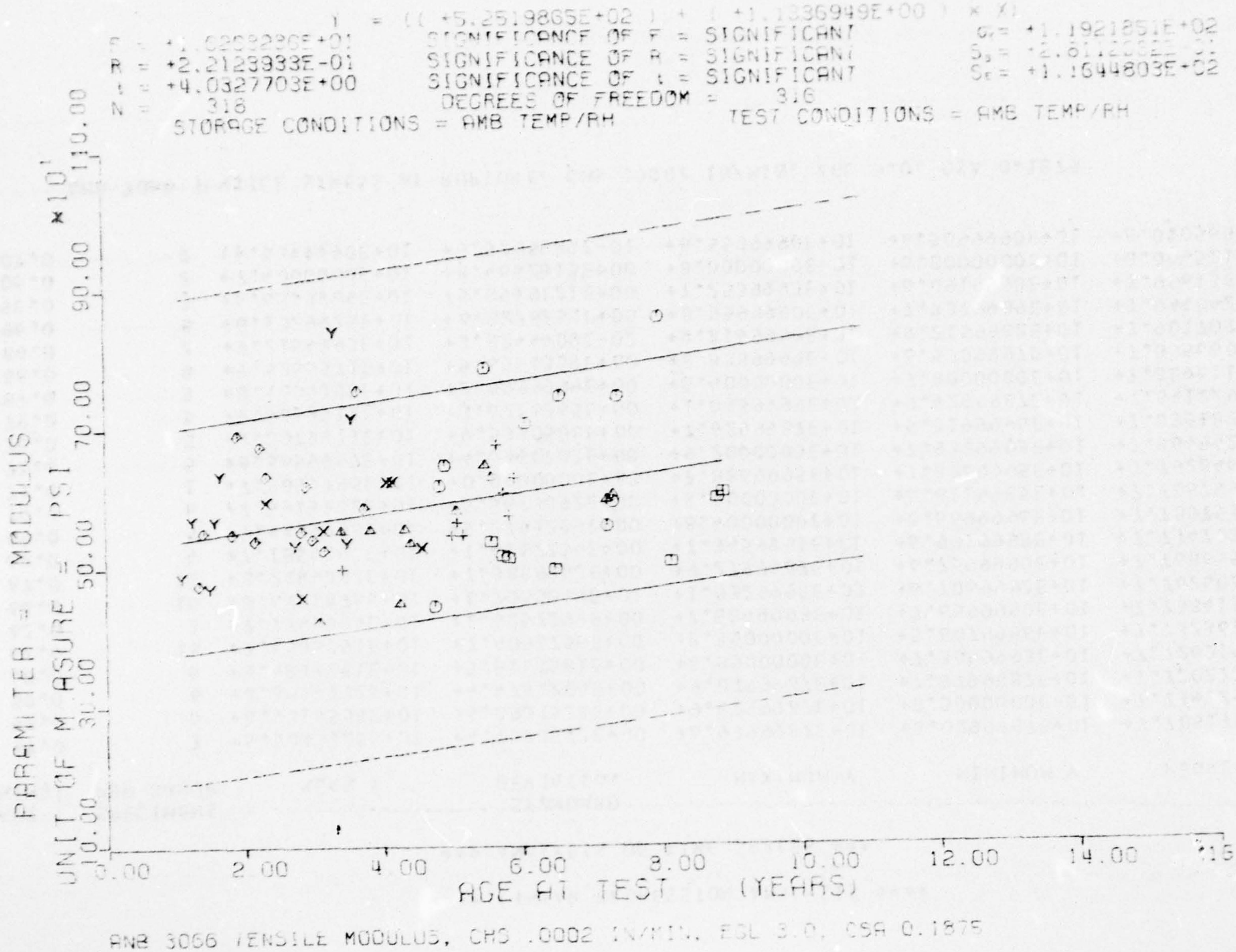
ANB 3066 TENSILE STRESS AT RUPTURE, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
57.0	3	+6.5033325E+01	+4.7501972E+00	+6.9799987E+01	+6.0299987E+01	+7.7081771E+01
58.0	6	+8.9316558E+01	+4.0901528E+00	+9.4299987E+01	+8.5000000E+01	+7.7142242E+01
59.0	6	+8.6399932E+01	+4.4781204E+00	+9.0799987E+01	+7.9799987E+01	+7.7202728E+01
60.0	6	+8.4833251E+01	+5.6117581E+00	+8.8500000E+01	+7.3899993E+01	+7.7263198E+01
61.0	16	+7.1586791E+01	+7.4096756E+00	+8.3500000E+01	+5.6079986E+01	+7.7323684E+01
62.0	2	+7.7749984E+01	+1.6257299E+00	+7.8899993E+01	+7.6599990E+01	+7.7384155E+01
66.0	10	+8.6251876E+01	+1.2065249E+01	+1.0329998E+02	+6.7069992E+01	+7.7626068E+01
67.0	12	+8.2184082E+01	+7.3889962E+00	+9.2799987E+01	+6.7599990E+01	+7.7686553E+01
68.0	4	+7.1854990E+01	+1.4712234E+00	+7.3459991E+01	+6.9919998E+01	+7.7747024E+01
69.0	9	+7.4159938E+01	+5.2791289E+00	+8.4000000E+01	+6.6699996E+01	+7.7807510E+01
70.0	6	+7.5919952E+01	+5.5477092E+00	+8.4000000E+01	+6.8219985E+01	+7.7867996E+01
71.0	1	+7.8869995E+01	+0.0000000E+83	+7.8869995E+01	+7.8869995E+01	+7.7928466E+01
73.0	5	+8.5659957E+01	+4.6340702E+00	+9.2000000E+01	+7.9399993E+01	+7.8049423E+01
78.0	5	+7.0079971E+01	+9.5330588E+00	+7.6299987E+01	+5.3199996E+01	+7.8351821E+01
79.0	5	+9.9819915E+01	+3.6276245E+00	+1.0439999E+02	+9.4299987E+01	+7.8412292E+01
87.0	3	+8.1000000E+01	+2.9999999E+00	+8.4000000E+01	+7.8000000E+01	+7.8896118E+01
88.0	9	+7.6256571E+01	+5.6556359E+00	+8.3389999E+01	+6.5809997E+01	+7.8956604E+01
89.0	2	+9.2164993E+01	+3.8244400E-02	+9.2169998E+01	+9.2159988E+01	+7.9017074E+01
96.0	5	+8.1329925E+01	+6.8278239E+00	+8.9599990E+01	+7.3379989E+01	+7.9440429E+01
98.0	5	+6.6553964E+01	+5.0549121E+00	+7.2539993E+01	+6.0919998E+01	+7.9561386E+01
106.0	2	+7.4000000E+01	+8.4852813E+00	+8.0000000E+01	+6.8000000E+01	+8.0045211E+01
107.0	2	+6.5349990E+01	+3.5295989E-01	+6.5599990E+01	+6.5099990E+01	+8.0105682E+01

AMR 3066 TENSILE STRESS AT RUPTURE, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875



Y = ((+5.2519865E+02) + (+1.1336949E+00) × X)
F = +1.6[illegible]E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = +2.2123933E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +4.0327703E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 318 DEGREES OF FREEDOM = 316
σ_Y = +1.1921851E+02
S_b = +2.81[illegible]
S_E = +1.1644803E+02
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI
×10¹
10.00
30.00
50.00
70.00
90.00
110.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
ANB 3066 TENSILE MODULUS, CHS .0002 IN/MIN, ESL 3.0, CSA 0.1875

Figure 6 - 5

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	5	+4.6779980E+02	+3.2790242E+01	+5.1200000E+02	+4.3200000E+02	+5.3993652E+02
15.0	10	+5.6939990E+02	+6.7163482E+01	+6.7300000E+02	+4.9100000E+02	+5.4220385E+02
16.0	15	+4.7600000E+02	+6.6922129E+01	+6.2900000E+02	+4.0800000E+02	+5.4333764E+02
17.0	10	+5.5179980E+02	+6.5380595E+01	+7.1300000E+02	+4.7500000E+02	+5.4447143E+02
18.0	5	+4.7119995E+02	+2.7869337E+01	+5.0200000E+02	+4.2700000E+02	+5.4560498E+02
19.0	5	+5.6819995E+02	+7.9276099E+01	+6.6700000E+02	+4.7100000E+02	+5.4673876E+02
20.0	5	+5.3359985E+02	+4.7066973E+01	+6.8000000E+02	+5.6400000E+02	+5.4787231E+02
22.0	5	+5.4939990E+02	+6.1561351E+01	+6.5800000E+02	+5.1100000E+02	+5.5013989E+02
23.0	5	+5.9219995E+02	+2.3562682E+01	+7.0700000E+02	+6.5300000E+02	+5.5127343E+02
26.0	2	+5.4000000E+02	+9.8994949E+00	+5.4700000E+02	+5.3300000E+02	+5.5467456E+02
27.0	3	+6.7556650E+02	+8.6581368E+01	+7.6000000E+02	+5.8700000E+02	+5.5580834E+02
28.0	15	+5.0606665E+02	+6.1700273E+01	+6.9300000E+02	+4.7700000E+02	+5.5694189E+02
33.0	5	+5.3259985E+02	+9.5510732E+01	+6.9900000E+02	+4.7400000E+02	+5.6261035E+02
34.0	7	+4.8571411E+02	+6.5619393E+01	+5.7500000E+02	+4.0000000E+02	+5.6374414E+02
35.0	3	+6.1956650E+02	+5.5428632E+01	+6.8300000E+02	+5.8000000E+02	+5.6487792E+02
36.0	10	+5.4250000E+02	+9.9025529E+01	+6.8700000E+02	+4.1300000E+02	+5.6601147E+02
37.0	1	+4.2200000E+02	+0.0000000E+79	+4.2200000E+02	+4.2200000E+02	+5.6714526E+02
38.0	14	+5.4692346E+02	+7.6734772E+01	+6.6700000E+02	+3.9500000E+02	+5.6827905E+02
40.0	5	+6.3979980E+02	+3.1696955E+02	+1.2130000E+03	+4.8400000E+02	+5.7054638E+02
41.0	8	+5.1875000E+02	+3.1833271E+01	+5.6500000E+02	+4.8300000E+02	+5.7167993E+02
42.0	3	+5.3633325E+02	+2.8005951E+01	+5.5300000E+02	+5.0400000E+02	+5.7281372E+02
43.0	1	+7.1600000E+02	+0.0000000E+99	+7.1600000E+02	+7.1600000E+02	+5.7394750E+02
44.0	4	+7.5575000F+02	+2.2383085E+02	+9.6600000E+02	+4.5800000E+02	+5.7508105E+02
45.0	1	+5.8700000E+02	+0.0000000E+07	+5.8700000E+02	+5.8700000E+02	+5.7621484E+02
46.0	13	+5.5446142E+02	+4.9567488E+01	+6.4300000E+02	+4.5400000E+02	+5.7734838E+02
49.0	3	+5.2433325E+02	+1.0152996E+02	+7.4100000E+02	+5.5600000E+02	+5.8074951E+02
50.0	2	+5.2400000E+02	+3.5355339E+01	+6.4900000E+02	+5.9900000E+02	+5.8188330E+02
51.0	5	+4.4900000E+02	+1.6263455E+01	+4.7100000E+02	+4.3100000E+02	+5.8301708E+02
52.0	4	+5.5625000E+02	+1.6479785E+01	+5.7300000E+02	+5.3800000E+02	+5.8415063E+02
53.0	16	+5.3555250E+02	+5.7104545E+01	+6.6000000E+02	+4.6200000E+02	+5.8528442E+02
55.0	4	+5.2925000E+02	+7.7478491E+01	+6.4200000E+02	+4.6900000E+02	+5.8755175E+02

ANB 3066 TENSILE MODULUS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
57.0	3	+4.4500000E+02	+3.1432467E+01	+4.7900000E+02	+4.1700000E+02	+5.8981909E+02
58.0	6	+6.1766650E+02	+9.0121399E+01	+7.4000000E+02	+5.1800000E+02	+5.9095288E+02
59.0	6	+6.4716650E+02	+6.3332192E+01	+7.3100000E+02	+5.8700000E+02	+5.9208642E+02
60.0	6	+5.4600000E+02	+6.1178427E+01	+6.1300000E+02	+4.7000000E+02	+5.9322021E+02
61.0	16	+5.6975000E+02	+5.6837194E+01	+6.7800000E+02	+4.5100000E+02	+5.9435400E+02
62.0	2	+5.4650000E+02	+3.7476659E+01	+5.7300000E+02	+5.2000000E+02	+5.9548754E+02
66.0	10	+7.1650000E+02	+9.8595976E+01	+8.8500000E+02	+6.0200000E+02	+6.0002246E+02
67.0	12	+5.8300000E+02	+9.2879198E+01	+7.4500000E+02	+4.4800000E+02	+6.0115600E+02
68.0	4	+5.7675000E+02	+4.6046172E+01	+7.1700000E+02	+6.2100000E+02	+6.0228979E+02
69.0	9	+5.4666650E+02	+5.7441274E+01	+6.7100000E+02	+4.9300000E+02	+6.0342358E+02
70.0	6	+5.4366650E+02	+4.7051744E+01	+5.9000000E+02	+4.6000000E+02	+6.0455712E+02
71.0	1	+6.2900000E+02	+0.0000000E+83	+6.2900000E+02	+6.2900000E+02	+6.0569091E+02
73.0	5	+7.0659985E+02	+1.2159481E+02	+8.6300000E+02	+5.7300000E+02	+6.0795825E+02
78.0	5	+4.9700000E+02	+5.7740800E+01	+5.7100000E+02	+4.3500000E+02	+6.1362670E+02
79.0	5	+7.4559985E+02	+3.7333630E+01	+7.9500000E+02	+6.9300000E+02	+6.1476049E+02
87.0	3	+5.8366650E+02	+2.4027761E+01	+6.0700000E+02	+5.5900000E+02	+6.2383007E+02
88.0	9	+5.9533325E+02	+9.2020378E+01	+7.6200000E+02	+4.9100000E+02	+6.2496362E+02
89.0	2	+7.4400000E+02	+7.9195959E+01	+8.0000000E+02	+6.8800000E+02	+6.2609741E+02
96.0	5	+8.5739990E+02	+3.6827544E+02	+1.3200000E+03	+5.1400000E+02	+6.3403320E+02
98.0	5	+5.0700000E+02	+3.0700162E+01	+5.5200000E+02	+4.7300000E+02	+6.3630053E+02
106.0	2	+5.9750000E+02	+2.4748737E+01	+6.1500000E+02	+5.8000000E+02	+6.4537011E+02
107.0	2	+5.0550000E+02	+6.5760930E+01	+6.5200000E+02	+5.5900000E+02	+6.4650390E+02

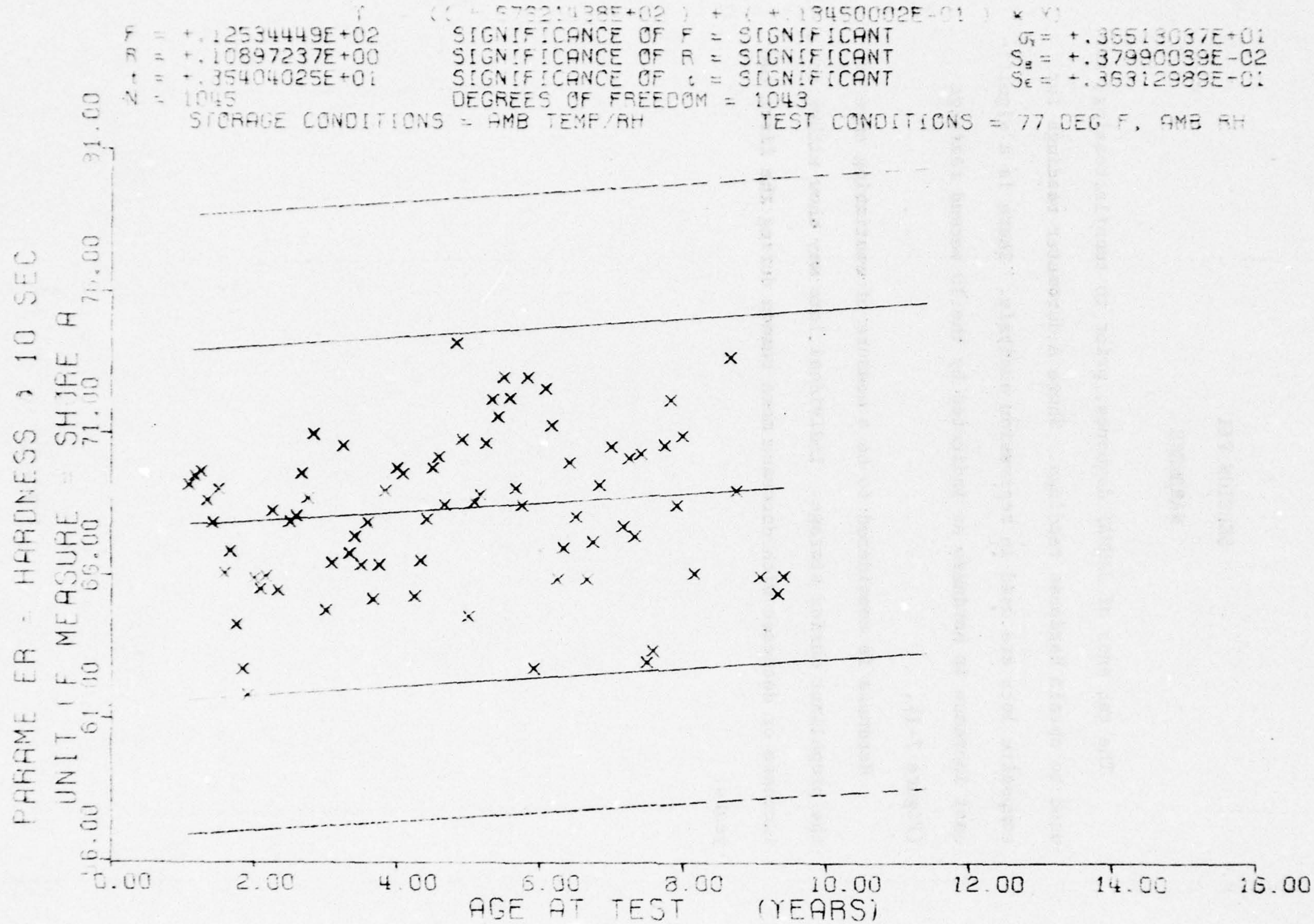
ANB 3066 TENSILE MODULUS, CHS .0002 IN/MIN, EGL 3.0, CSA 0.1875

SECTION VII

HARDNESS

The tab ends of JANNAF dogbones, prior to tensile testing, are used to obtain hardness readings. Shore A durometer readings for composite lots are used in regression analysis. There is a significant increase in hardness as indicated by the 10 second readings (Figure 7-1).

Hardness is considered to be a measure of continuing cure in the propellant during storage. Individual lots may show either an increase or decrease with decrease more common during the first two years.



ANB 3066 SHORE A HARDNESS AT 10 SECONDS, COMPOSITE PLOT

FIGURE 7-1

*** LINEAR REGRESSION ANALYSIS ***

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	34	+.69205871E+02	+.31601631E+01	+.72000000E+02	+.63000000E+02	+.67796279E+02
14.0	39	+.67512817E+02	+.35679257E+01	+.75000000E+02	+.61000000E+02	+.67809738E+02
15.0	37	+.67675674E+02	+.22367393E+01	+.73000000E+02	+.63000000E+02	+.67823181E+02
16.0	43	+.66666656E+02	+.31913002E+01	+.72000000E+02	+.62000000E+02	+.67836624E+02
17.0	47	+.67872338E+02	+.35729480E+01	+.72000000E+02	+.59000000E+02	+.67850082E+02
18.0	49	+.67061218E+02	+.38506139E+01	+.75000000E+02	+.60000000E+02	+.67863525E+02
19.0	31	+.66096771E+02	+.40690280E+01	+.74000000E+02	+.61000000E+02	+.67876983E+02
20.0	31	+.66870968E+02	+.39643573E+01	+.74000000E+02	+.62000000E+02	+.67890426E+02
21.0	10	+.64299987E+02	+.22632326E+01	+.70000000E+02	+.62000000E+02	+.67903884E+02
22.0	16	+.62750000E+02	+.25690465E+01	+.67000000E+02	+.60000000E+02	+.67917327E+02
23.0	6	+.61833328E+02	+.11690451E+01	+.63000000E+02	+.60000000E+02	+.67930786E+02
24.0	14	+.65928558E+02	+.23026501E+01	+.69000000E+02	+.61000000E+02	+.67944229E+02
25.0	9	+.65555541E+02	+.13333333E+01	+.68000000E+02	+.64000000E+02	+.67957687E+02
26.0	13	+.66000000E+02	+.91287093E+00	+.68000000E+02	+.65000000E+02	+.67971130E+02
27.0	10	+.63299987E+02	+.22135943E+01	+.72000000E+02	+.64000000E+02	+.67984588E+02
28.0	10	+.65500000E+02	+.13540064E+01	+.67000000E+02	+.63000000E+02	+.67998031E+02
30.0	10	+.67899993E+02	+.22335820E+01	+.70000000E+02	+.64000000E+02	+.68024932E+02
31.0	10	+.68099990E+02	+.15238839E+01	+.70000000E+02	+.65000000E+02	+.68036375E+02
32.0	5	+.69599990E+02	+.54772255E+00	+.70000000E+02	+.69000000E+02	+.68051834E+02
33.0	15	+.68733322E+02	+.17511900E+01	+.72000000E+02	+.67000000E+02	+.68065277E+02
34.0	5	+.71000000E+02	+.70710678E+00	+.72000000E+02	+.70000000E+02	+.68078735E+02
36.0	15	+.64799987E+02	+.14735767E+01	+.67000000E+02	+.62000000E+02	+.68105636E+02
37.0	15	+.66466659E+02	+.32041639E+01	+.71000000E+02	+.62000000E+02	+.68119079E+02
39.0	5	+.70599990E+02	+.13416407E+01	+.72000000E+02	+.69000000E+02	+.68145980E+02
40.0	10	+.68799987E+02	+.10327955E+01	+.68000000E+02	+.65000000E+02	+.68159423E+02
41.0	10	+.67399993E+02	+.35339622E+01	+.74000000E+02	+.63000000E+02	+.68172882E+02
42.0	5	+.66399993E+02	+.54772255E+00	+.67000000E+02	+.66000000E+02	+.68186325E+02
43.0	10	+.67899993E+02	+.23309511E+01	+.72000000E+02	+.65000000E+02	+.68199783E+02
44.0	5	+.65199996E+02	+.16431676E+01	+.67000000E+02	+.63000000E+02	+.68213226E+02
45.0	5	+.66399993E+02	+.54772255E+00	+.67000000E+02	+.66000000E+02	+.68226684E+02
46.0	5	+.69000000E+02	+.10000000E+01	+.70000000E+02	+.68000000E+02	+.68240127E+02

AVR 3066 SHORE A HARDNESS AT 10 SECONDS, COMPOSITE PLOT

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
48.0	5	+.69799987E+02	+.25884353E+01	+.73000000E+02	+.67000000E+02	+.68267028E+02
49.0	15	+.69599990E+02	+.32026774E+01	+.76000000E+02	+.67000000E+02	+.68280487E+02
51.0	10	+.65299987E+02	+.51218486E+01	+.72000000E+02	+.59000000E+02	+.68307388E+02
52.0	20	+.66549987E+02	+.40193610E+01	+.71000000E+02	+.60000000E+02	+.68320831E+02
53.0	5	+.68000000E+02	+.22403703E+01	+.72000000E+02	+.65000000E+02	+.68334274E+02
54.0	10	+.69799987E+02	+.11352924E+01	+.71000000E+02	+.68000000E+02	+.68347732E+02
55.0	11	+.70181808E+02	+.35005050E+01	+.76000000E+02	+.63000000E+02	+.68361175E+02
56.0	10	+.68500000E+02	+.45030653E+01	+.76000000E+02	+.63000000E+02	+.68374633E+02
58.0	5	+.74199996E+02	+.14832396E+01	+.76000000E+02	+.72000000E+02	+.68401535E+02
59.0	5	+.72799987E+02	+.44721359E+00	+.71000000E+02	+.70000000E+02	+.68414978E+02
60.0	10	+.64599990E+02	+.24129281E+01	+.67000000E+02	+.60000000E+02	+.68428436E+02
61.0	5	+.68599990E+02	+.15165750E+01	+.70000000E+02	+.67000000E+02	+.68441879E+02
62.0	15	+.63866653E+02	+.14074631E+01	+.71000000E+02	+.67000000E+02	+.68455337E+02
63.0	15	+.73[illegible]666E+02	+.21041263E+01	+.76000000E+02	+.65000000E+02	+.68468780E+02
64.0	5	+.72199996E+02	+.83666002E+00	+.73000000E+02	+.71000000E+02	+.68482238E+02
65.0	15	+.71599990E+02	+.93561076E+00	+.73000000E+02	+.70000000E+02	+.68495681E+02
66.0	10	+.73000000E+02	+.23570226E+01	+.78000000E+02	+.70000000E+02	+.68509124E+02
67.0	15	+.72266662E+02	+.23135213E+01	+.75000000E+02	+.68000000E+02	+.68522583E+02
68.0	30	+.6[illegible]99990E+02	+.31769645E+01	+.73000000E+02	+.62000000E+02	+.68536026E+02
69.0	10	+.68500000E+02	+.29154759E+01	+.72000000E+02	+.65000000E+02	+.68549484E+02
70.0	5	+.73000000E+02	+.70710678E+00	+.74000000E+02	+.72000000E+02	+.68562927E+02
71.0	5	+.62799987E+02	+.44721359E+00	+.63000000E+02	+.62000000E+02	+.68576385E+02
73.0	5	+.72599990E+02	+.54772255E+00	+.73000000E+02	+.72000000E+02	+.68603286E+02
74.0	10	+.71299987E+02	+.20575065E+01	+.74000000E+02	+.68000000E+02	+.68616729E+02
75.0	10	+.65399993E+02	+.73786478E+00	+.67000000E+02	+.65000000E+02	+.68630187E+02
76.0	5	+.67000000E+02	+.37416573E+01	+.71000000E+02	+.63000000E+02	+.68643630E+02
77.0	5	+.70000000E+02	+.70710678E+00	+.71000000E+02	+.69000000E+02	+.68657073E+02
78.0	20	+.68099990E+02	+.24899799E+01	+.71000000E+02	+.63000000E+02	+.68670532E+02
80.0	10	+.65399993E+02	+.11972189E+01	+.68000000E+02	+.64000000E+02	+.68697433E+02
81.0	20	+.67199996E+02	+.44200500E+01	+.75000000E+02	+.63000000E+02	+.68710876E+02
82.0	5	+.67199996E+02	+.21679483E+01	+.72000000E+02	+.67000000E+02	+.68724334E+02

ZHB 3066 SHORE A HARDNESS AT 10 SECONDS, COMPOSITE PLOT

*** LINEAR REGRESSION ANALYSIS ***

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
84.0	20	+.70549987E+02	+.25644328E+01	+.76000000E+02	+.68000000E+02	+.68751235E+02
86.0	20	+.67750000E+02	+.39983549E+01	+.75000000E+02	+.59000000E+02	+.68778137E+02
87.0	20	+.70149993E+02	+.24121403E+01	+.73000000E+02	+.62000000E+02	+.68791580E+02
88.0	10	+.67399993E+02	+.15055453E+01	+.69000000E+02	+.65000000E+02	+.68805038E+02
89.0	10	+.70299937E+02	+.94868329E+00	+.72000000E+02	+.69000000E+02	+.68818481E+02
90.0	10	+.63000000E+02	+.49441323E+01	+.69000000E+02	+.57000000E+02	+.68831924E+02
91.0	5	+.63399993E+02	+.54772255E+00	+.64000000E+02	+.63000000E+02	+.68845382E+02
93.0	5	+.70399990E+02	+.54772255E+00	+.71000000E+02	+.70000000E+02	+.68872283E+02
94.0	10	+.72199996E+02	+.13165611E+01	+.75000000E+02	+.71000000E+02	+.68885726E+02
95.0	10	+.68500000E+02	+.35355339E+01	+.73000000E+02	+.65000000E+02	+.68899185E+02
96.0	15	+.70933319E+02	+.10327955E+01	+.72000000E+02	+.69000000E+02	+.68912628E+02
98.0	10	+.66099990E+02	+.48177911E+01	+.71000000E+02	+.60000000E+02	+.68939529E+02
104.0	10	+.73699996E+02	+.67494855E+00	+.75000000E+02	+.73000000E+02	+.69020233E+02
106.0	10	+.69000000E+02	+.61101009E+01	+.77000000E+02	+.61000000E+02	+.69033676E+02
109.0	5	+.66000000E+02	+.15811388E+01	+.68000000E+02	+.64000000E+02	+.69087478E+02
112.0	10	+.65399993E+02	+.69920587E+00	+.67000000E+02	+.65000000E+02	+.69127838E+02
115.0	5	+.66000000E+02	+.14142135E+01	+.67000000E+02	+.64000000E+02	+.69141281E+02

MIL 3066 SHORE A HARDNESS AT 10 SECONDS, COMPOSITE PLOT

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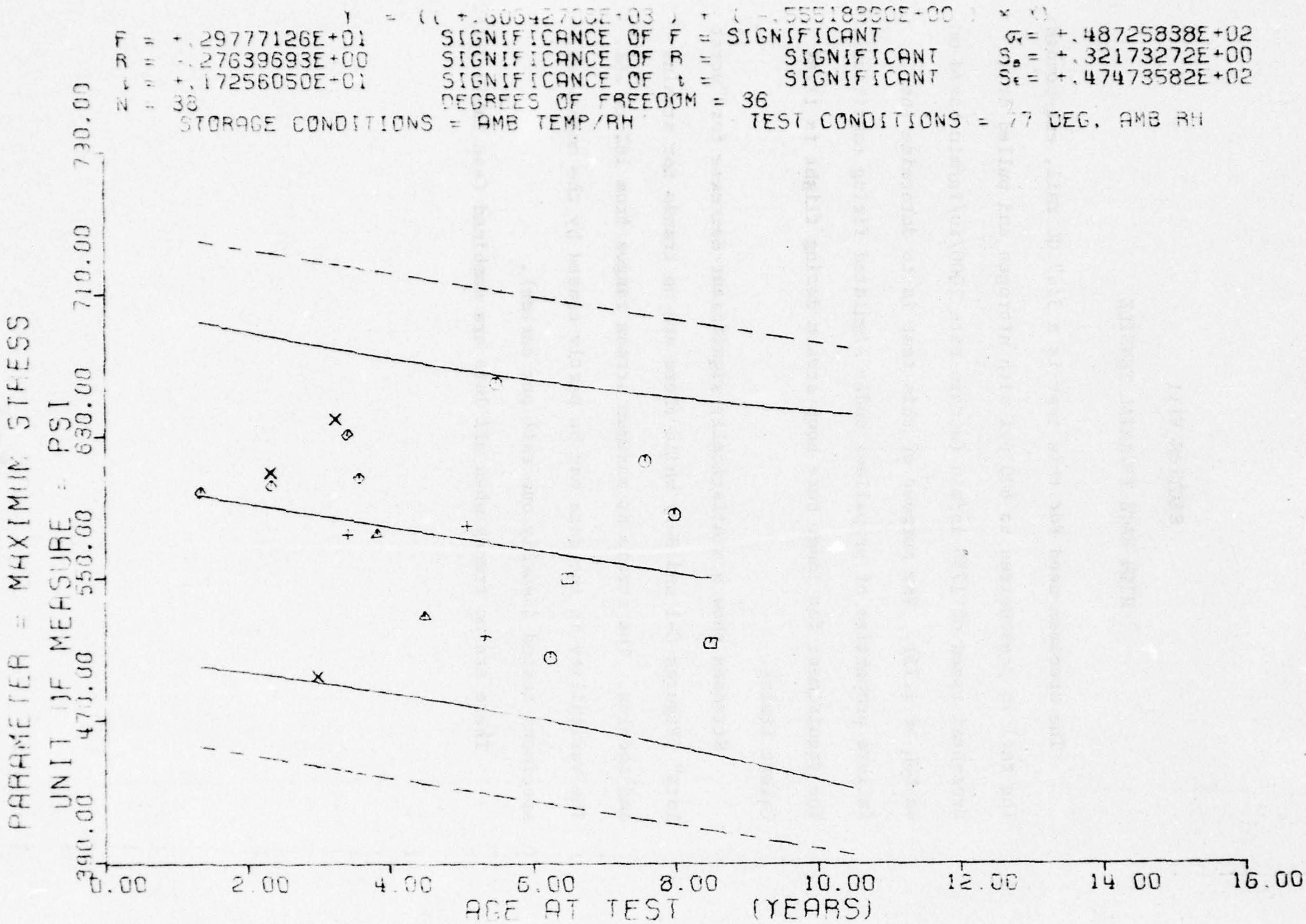
SECTION VIII

HIGH RATE TRIAXIAL TENSILE

The specimen used for this test is a 3/4" GL rail, end-bonded. The rail is pressurized to 600 psi with nitrogen and pulled at a crosshead speed of 1750 in/min (strain rate 1000/in/in/min based on an EGL of 1.75). The purpose of this test is to determine the failure properties of propellant under simulated firing conditions. The requirement for inner bore hoop strain during flight is 11.5% (alert limit).

Stresses show a statistically significant decrease for "worst lots" (Figures 8-1 and 8-2) while there are no trends for strains and modulus. The strain at maximum stress ranges from 16% to 26%. The variability in the data may be partly caused by the number of specimens tested (usually one rail per carton).

There are no trends when all lots are combined (see Table 2-1).



ANB 3066 TENSILE MAXIMUM STRESS, CHS 1750, CSA 1.8750, 600 PSI

FIGURE 8-1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
16.0	4	+.59875000E+03	+.20155644E+02	+.62000000E+03	+.57500000E+03	+.59754394E+03
28.0	4	+.60625000E+03	+.13768926E+02	+.62000000E+03	+.59000000E+03	+.59088183E+03
36.0	2	+.49500000E+03	+.14142135E+02	+.50500000E+03	+.48500000E+03	+.58644042E+03
39.0	2	+.64000000E+03	+.14142135E+02	+.65000000E+03	+.63000000E+03	+.58477465E+03
41.0	4	+.60313989E+03	+.32709761E+02	+.63590991E+03	+.57500000E+03	+.58366430E+03
43.0	2	+.60702490E+03	+.64302697E+01	+.61155981E+03	+.60248999E+03	+.58255395E+03
46.0	2	+.57500000E+03	+.00000000E+60	+.57500000E+03	+.57500000E+03	+.58088842E+03
54.0	4	+.52875000E+03	+.28099525E+02	+.56000000E+03	+.50500000E+03	+.57644702E+03
61.0	2	+.58000000E+03	+.14142135E+02	+.59000000E+03	+.57000000E+03	+.57256079E+03
64.0	2	+.51756469E+03	+.17750086E+02	+.53010986E+03	+.50501977E+03	+.57089526E+03
66.0	2	+.66000000E+03	+.70710678E+01	+.66500000E+03	+.65500000E+03	+.56978491E+03
75.0	1	+.50500000E+03	+.00000000E+80	+.50500000E+03	+.50500000E+03	+.56478808E+03
78.0	2	+.55000000E+03	+.70710678E+01	+.55500000E+03	+.54500000E+03	+.56312255E+03
91.0	2	+.61595483E+03	+.66546962E+01	+.62063989E+03	+.61126977E+03	+.55590527E+03
96.0	1	+.58587988E+03	+.00000000E+92	+.58587988E+03	+.58587988E+03	+.55312939E+03
102.0	2	+.51299487E+03	+.47389825E+01	+.51632983E+03	+.50965991E+03	+.54979809E+03

ANB 3066 TENSILE MAXIMUM STRESS, CHS 1750, CSA 1.8750, 600 PSI

Y = ((+.59684060E+03) + (-.62687362E+00) * X)

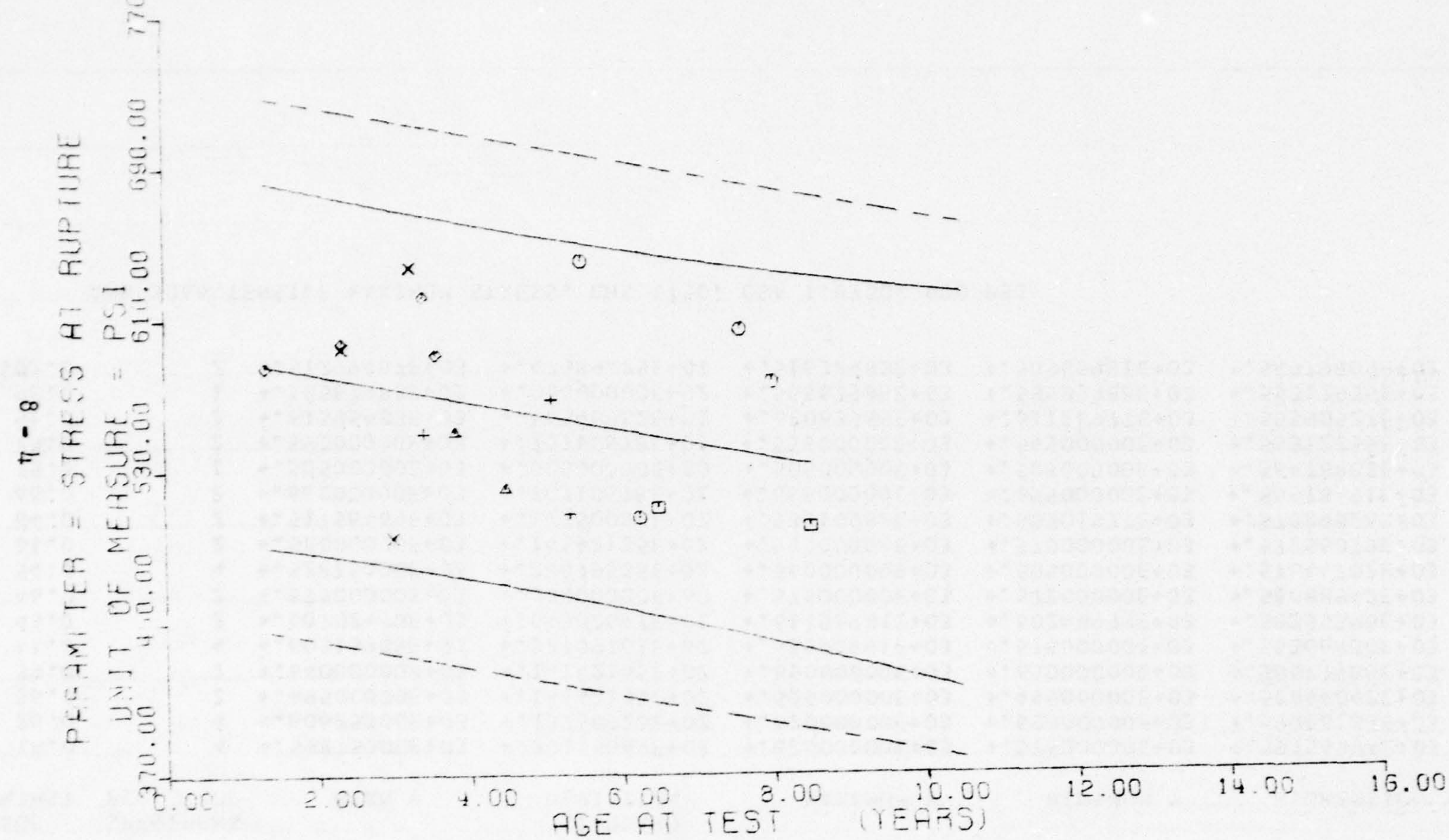
F = +.38812087E+01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +.48745757E+02

R = -.31196012E+00 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = -.31813751E+00

t = +.19700770E+01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +.46951941E+02

N = 38 DEGREES OF FREEDOM = 36

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 TENSILE STRESS AT RUPTURE, CHS 1750, CSA 1.8750, 600 PSI

FIGURE 8-2

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
16.0	4	+.58500000E+03	+.24832774E+02	+.61000000E+03	+.55500000E+03	+.58661059E+03
28.0	4	+.59625000E+03	+.74999999E+01	+.60500000E+03	+.59000000E+03	+.57908813E+03
36.0	2	+.49500000E+03	+.14142135E+02	+.50500000E+03	+.48500000E+03	+.57407299E+03
39.0	2	+.63750000E+03	+.17677669E+02	+.65000000E+03	+.62500000E+03	+.57219238E+03
41.0	4	+.53586743E+03	+.42013530E+02	+.62880981E+03	+.54500000E+03	+.57093872E+03
43.0	2	+.59115478E+03	+.12046838E+02	+.59966992E+03	+.58263989E+03	+.56968481E+03
46.0	2	+.55000000E+03	+.70710678E+01	+.55500000E+03	+.54500000E+03	+.56780419E+03
54.0	4	+.52000000E+03	+.28577380E+02	+.55500000E+03	+.49000000E+03	+.56278930E+03
61.0	2	+.56750000E+03	+.17677669E+02	+.58000000E+03	+.55500000E+03	+.55840112E+03
64.0	2	+.50705981E+03	+.14937504E+02	+.51761987E+03	+.49650000E+03	+.55652050E+03
66.0	2	+.64000000E+03	+.70710678E+01	+.64500000E+03	+.63500000E+03	+.55526684E+03
75.0	1	+.50500000E+03	+.00000000E+92	+.50500000E+03	+.50500000E+03	+.54962500E+03
78.0	2	+.51000000E+03	+.00000000E+96	+.51000000E+03	+.51000000E+03	+.54774438E+03
91.0	2	+.60359497E+03	+.51147027E+01	+.60720996E+03	+.59997998E+03	+.53959497E+03
96.0	1	+.57602978E+03	+.00000000E+04	+.57602978E+03	+.57602978E+03	+.53646069E+03
102.0	2	+.49931982E+03	+.61842522E+01	+.50368994E+03	+.49494995E+03	+.53269946E+03

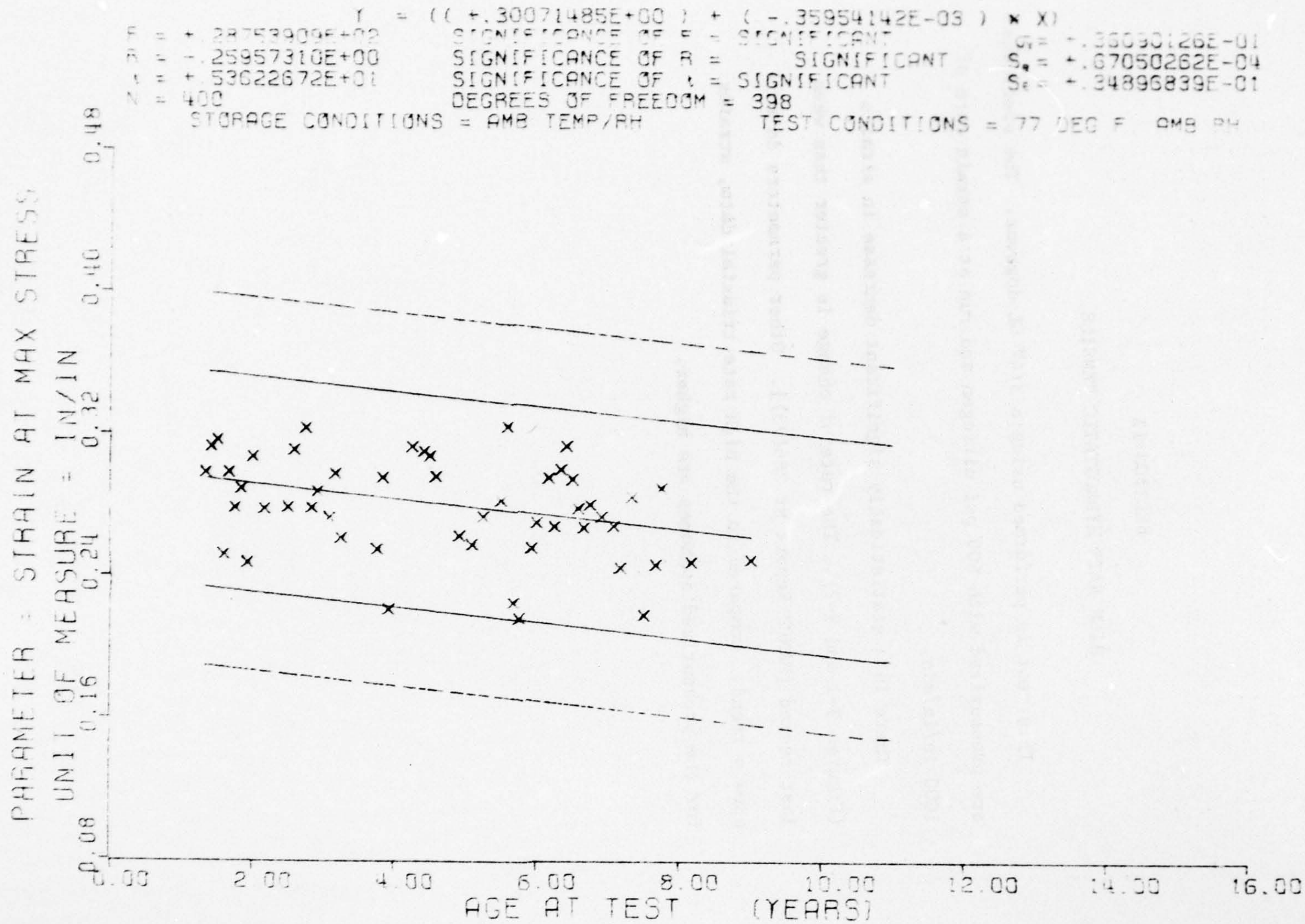
ANB 3066 TENSILE STRESS AT RUPTURE, CHS 1750, CSA 1.8750, 600 PSI

SECTION IX

HIGH RATE HYDROSTATIC TENSILE

This test is performed using a 3/4" GL dogbone. The specimens are pressurized with 600 psi nitrogen and run at a strain rate of 1000 in/in/min.

There is a statistically significant decrease in strains (Figures 9-1 and 9-2). The rate of change is greater than when last tested [MANCP Report Nr 266(73)]. Other parameters do not show a trend. Compared to the high rate triaxial data, strains for the pressurized dogbones are higher.



ANB 3066 TENSILE STRAIN AT MAX STRESS, CHS 1750, CSA 0.1875, 600 PSI, COMPOSITE

FIGURE 9-1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
16.0	10	+.29859972E+00	+.28315213E-01	+.34599995E+00	+.25000000E+00	+.29496216E+00
17.0	5	+.31319975E+00	+.20959833E-01	+.33299994E+00	+.28299999E+00	+.29460263E+00
18.0	13	+.31692266E+00	+.30565215E-01	+.36599999E+00	+.26579999E+00	+.29424309E+00
19.0	6	+.25243312E+00	+.22227808E-01	+.28709995E+00	+.22429996E+00	+.29388356E+00
20.0	5	+.29879969E+00	+.11742722E-01	+.31499999E+00	+.28799998E+00	+.29352396E+00
21.0	3	+.27874970E+00	+.40064993E-01	+.33299994E+00	+.22499996E+00	+.29316443E+00
22.0	18	+.23961628E+00	+.23033179E-01	+.32299995E+00	+.23939996E+00	+.29280489E+00
23.0	6	+.24776649E+00	+.19519492E-01	+.26889997E+00	+.21399998E+00	+.29244536E+00
24.0	19	+.30755233E+00	+.21176123E-01	+.35099995E+00	+.26099997E+00	+.29208582E+00
26.0	16	+.27828035E+00	+.43649518E-01	+.33299994E+00	+.21649998E+00	+.29136675E+00
30.0	15	+.27399968E+00	+.24237443E-01	+.31999999E+00	+.24239997E+00	+.28992855E+00
31.0	10	+.31149965E+00	+.40249496E-01	+.36799997E+00	+.22999995E+00	+.28956902E+00
33.0	5	+.32379966E+00	+.12802926E-01	+.33939997E+00	+.30599999E+00	+.28884994E+00
34.0	13	+.27273814E+00	+.22876371E-01	+.32479995E+00	+.23709994E+00	+.28849041E+00
35.0	10	+.23809952E+00	+.25684131E-01	+.31399995E+00	+.24299997E+00	+.28813087E+00
37.0	4	+.27324986E+00	+.17747353E-01	+.29799997E+00	+.25699996E+00	+.28741180E+00
38.0	13	+.29807651E+00	+.30051173E-01	+.34799998E+00	+.23199999E+00	+.28705227E+00
39.0	10	+.26137968E+00	+.37461215E-01	+.30599999E+00	+.21169996E+00	+.28669273E+00
40.0	5	+.25539983E+00	+.30843710E-01	+.30039999E+00	+.22599995E+00	+.28453546E+00
46.0	5	+.29579961E+00	+.26399379E-01	+.32299995E+00	+.25499999E+00	+.28417593E+00
47.0	5	+.22139984E+00	+.22590252E-01	+.25199997E+00	+.18899995E+00	+.28381639E+00
51.0	5	+.31319975E+00	+.15356095E-01	+.33299994E+00	+.29199999E+00	+.28237819E+00
53.0	5	+.31059986E+00	+.49908419E-01	+.36599999E+00	+.25000000E+00	+.28165912E+00
54.0	13	+.30403966E+00	+.23651541E-01	+.33299994E+00	+.26599997E+00	+.28129959E+00
55.0	9	+.29633307E+00	+.14119757E-01	+.32299995E+00	+.27899998E+00	+.28094005E+00
59.0	3	+.26299995E+00	+.64366134E-01	+.30599999E+00	+.18899995E+00	+.27950185E+00
61.0	5	+.25799977E+00	+.17876761E-01	+.28099995E+00	+.23999994E+00	+.27878278E+00
63.0	10	+.27377957E+00	+.40863491E-01	+.35699999E+00	+.22839999E+00	+.27806371E+00
66.0	5	+.28279980E+00	+.95515523E-02	+.28799998E+00	+.26599997E+00	+.27698510E+00
67.0	5	+.32439970E+00	+.37781969E-01	+.37899994E+00	+.28799998E+00	+.27662557E+00
68.0	5	+.22519907E+00	+.76634962E-02	+.22999995E+00	+.21199995E+00	+.27626597E+00

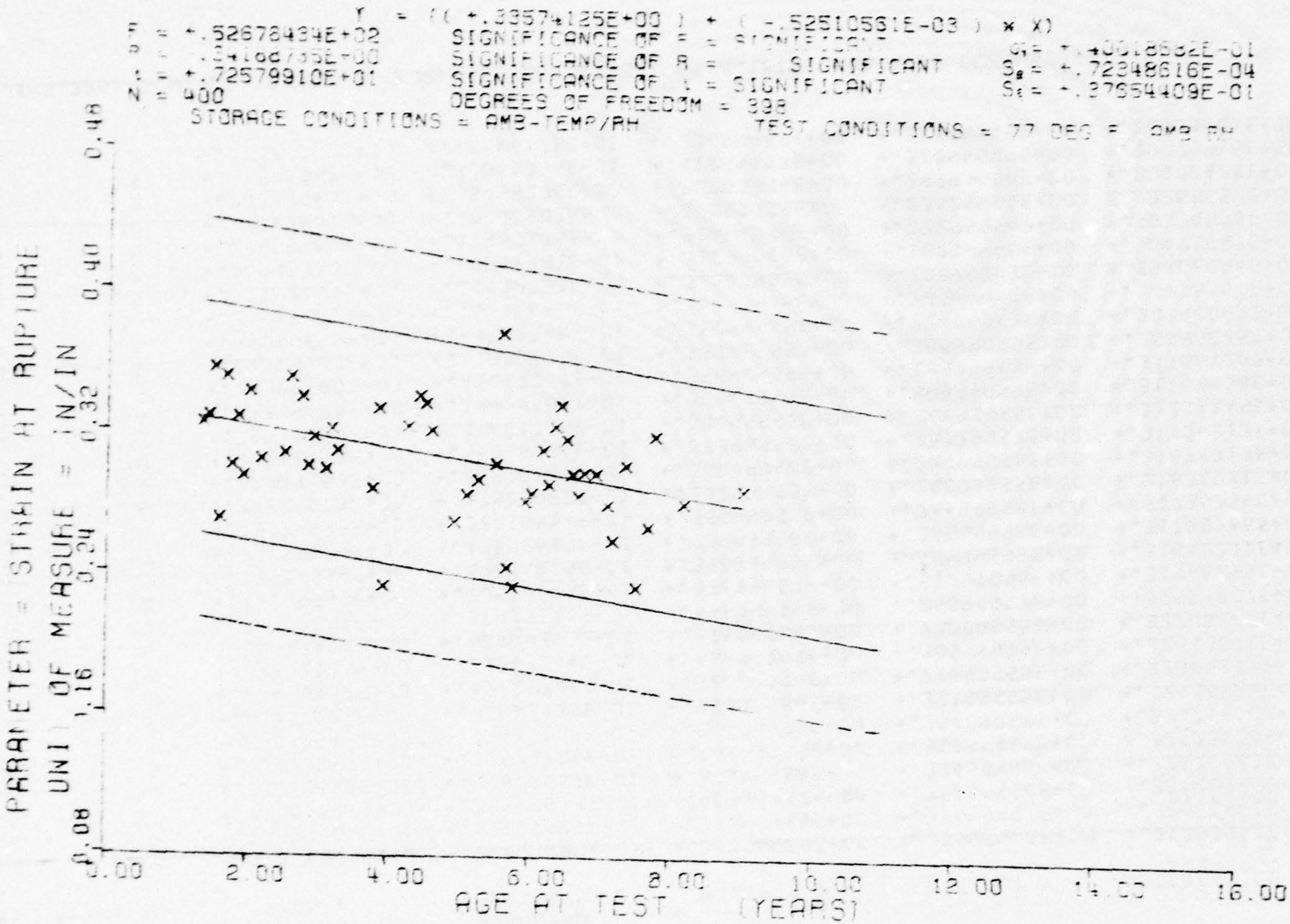
ANB 3066 TENSILE STRAIN AT MAX STRESS, CHS 1750, CSA 0.1875, 600 PSI, COMPOSITE

LINEAR REGRESSION ANALYSIS

ANALYSIS OF TIME SERIES

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
69.0	5	+.21629977E+00	+.10337753E-01	+.22799995E+00	+.20459997E+00	+.27590644E+00
71.0	5	+.25583970E+00	+.18061159E-01	+.27679997E+00	+.23399996E+00	+.27518737E+00
72.0	5	+.27019977E+00	+.15405004E-01	+.28899997E+00	+.24599999E+00	+.27482783E+00
74.0	10	+.29549963E+00	+.21509663E-01	+.31999999E+00	+.26099997E+00	+.27410876E+00
75.0	5	+.26799982E+00	+.14818045E-01	+.28299999E+00	+.25000000E+00	+.27374923E+00
76.0	5	+.29999977E+00	+.30604222E-01	+.33799997E+00	+.27199995E+00	+.27338969E+00
77.0	5	+.31319975E+00	+.20525940E-01	+.33299994E+00	+.28799998E+00	+.27303016E+00
78.0	10	+.29459959E+00	+.22076380E-01	+.32299995E+00	+.26099997E+00	+.27267056E+00
79.0	4	+.27824974E+00	+.15375637E-01	+.29399996E+00	+.25799995E+00	+.27231103E+00
80.0	5	+.26739978E+00	+.32831756E-01	+.30199998E+00	+.23399996E+00	+.27195149E+00
81.0	9	+.28031069E+00	+.23974127E-01	+.33199995E+00	+.22099995E+00	+.27159196E+00
83.0	5	+.27359980E+00	+.17546960E-01	+.29699999E+00	+.25199997E+00	+.27087289E+00
85.0	5	+.26839977E+00	+.27173222E-01	+.28899997E+00	+.22099995E+00	+.27015382E+00
86.0	11	+.24480867E+00	+.38870492E-01	+.29699999E+00	+.19199997E+00	+.26979428E+00
88.0	11	+.28472691E+00	+.34426770E-01	+.34799998E+00	+.22999995E+00	+.26907515E+00
90.0	6	+.21816647E+00	+.15212029E-01	+.23419994E+00	+.20089995E+00	+.26835608E+00
92.0	5	+.24663978E+00	+.15296759E-01	+.27309995E+00	+.23539996E+00	+.26763701E+00
93.0	10	+.23989958E+00	+.24135362E-01	+.33999997E+00	+.25499999E+00	+.26727747E+00
98.0	6	+.24821645E+00	+.14497016E-01	+.27239996E+00	+.23619997E+00	+.26547974E+00
108.0	5	+.24967974E+00	+.14124541E-01	+.27449995E+00	+.24029999E+00	+.26188433E+00

ANB 3066 TENSILE STRAIN AT MAX STRESS; CHS 1750, CSA 0.1875, 600 PSI, COMPOSITE



ANB 3066 TENSILE STRAIN AT RUPTURE, CHB 1750, CSA 0.1875, 600 PSI, COMPOSITE

FIGURE 9-2

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
16.0	10	+.32509970E+00	+.22943089E-01	+.36199998E+00	+.28999996E+00	+.32733952E+00
17.0	5	+.32899969E+00	+.80119585E-02	+.33699995E+00	+.31699997E+00	+.32681441E+00
18.0	13	+.35604572E+00	+.39813079E-01	+.40899997E+00	+.29359996E+00	+.32628935E+00
19.0	6	+.27066642E+00	+.21829558E-01	+.30449998E+00	+.23469996E+00	+.32576423E+00
20.0	5	+.35039959E+00	+.22929787E-01	+.36899995E+00	+.31999999E+00	+.32523912E+00
21.0	8	+.30097470E+00	+.35422705E-01	+.35999995E+00	+.25609999E+00	+.32471400E+00
22.0	18	+.32837724E+00	+.33348729E-01	+.37299996E+00	+.27199995E+00	+.32418888E+00
23.0	6	+.29494982E+00	+.15922731E-01	+.32009994E+00	+.27699995E+00	+.32366377E+00
24.0	19	+.34251528E+00	+.18249144E-01	+.36899995E+00	+.30599999E+00	+.32313871E+00
26.0	16	+.30447453E+00	+.48404763E-01	+.37500000E+00	+.23209995E+00	+.32208847E+00
30.0	15	+.30773293E+00	+.27085242E-01	+.35699999E+00	+.26099997E+00	+.31998807E+00
31.0	10	+.35109949E+00	+.20514073E-01	+.37699997E+00	+.31299996E+00	+.31946295E+00
33.0	5	+.33979964E+00	+.19834815E-01	+.35699999E+00	+.30599999E+00	+.31841272E+00
34.0	13	+.30058425E+00	+.12552616E-01	+.32999998E+00	+.28069996E+00	+.31788766E+00
35.0	10	+.31729972E+00	+.27019814E-01	+.35099995E+00	+.26499998E+00	+.31736254E+00
37.0	4	+.29899973E+00	+.17572485E-01	+.32299995E+00	+.28099995E+00	+.31631231E+00
38.0	13	+.32207655E+00	+.24822183E-01	+.38099998E+00	+.28999996E+00	+.31578719E+00
39.0	10	+.30946958E+00	+.55318091E-01	+.37399995E+00	+.23729997E+00	+.31526213E+00
45.0	5	+.28799963E+00	+.19471746E-01	+.30699998E+00	+.26699995E+00	+.31211149E+00
46.0	5	+.33339977E+00	+.18410582E-01	+.35699999E+00	+.30599999E+00	+.31158638E+00
47.0	5	+.23299980E+00	+.40032057E-01	+.29699999E+00	+.18899995E+00	+.31106126E+00
51.0	5	+.32319980E+00	+.13030776E-01	+.33799999E+00	+.30599999E+00	+.30896085E+00
53.0	5	+.34059959E+00	+.43852890E-01	+.38299995E+00	+.27499997E+00	+.30791062E+00
54.0	15	+.33613282E+00	+.16588689E-01	+.35799998E+00	+.30589997E+00	+.30738550E+00
55.0	9	+.32122194E+00	+.21882333E-01	+.35699999E+00	+.28899997E+00	+.30686044E+00
59.0	3	+.26933330E+00	+.69658781E-01	+.31299996E+00	+.18899995E+00	+.30475997E+00
61.0	5	+.28459984E+00	+.17460176E-01	+.31499999E+00	+.27299994E+00	+.30370980E+00
63.0	10	+.29317957E+00	+.48006902E-01	+.35699999E+00	+.23529994E+00	+.30265957E+00
66.0	5	+.30239963E+00	+.85468076E-02	+.30999994E+00	+.28799998E+00	+.30108428E+00
67.0	5	+.37539962E+00	+.30054834E-01	+.41299998E+00	+.32899999E+00	+.30055916E+00
68.0	5	+.24379992E+00	+.18646171E-01	+.25499999E+00	+.21199995E+00	+.30003404E+00

ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 1750, CSA 0.1875, 600 PSI, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
63.0	5	+.23261982E+00	+.16652460E-01	+.25659996E+00	+.21029996E+00	+.29950892E+00
71.0	5	+.28127974E+00	+.29159459E-01	+.31149995E+00	+.23899996E+00	+.29845875E+00
72.0	5	+.28579974E+00	+.17559408E-01	+.30599999E+00	+.26399999E+00	+.29793363E+00
74.0	10	+.31029963E+00	+.14794364E-01	+.34199994E+00	+.28799998E+00	+.29688340E+00
75.0	5	+.29079967E+00	+.11613269E-01	+.30399996E+00	+.27499997E+00	+.29635828E+00
76.0	5	+.32379966E+00	+.16075387E-01	+.33999997E+00	+.30599999E+00	+.29583323E+00
77.0	5	+.23559966E+00	+.32417420E-01	+.37709996E+00	+.30599999E+00	+.29530811E+00
78.0	10	+.31639963E+00	+.24188768E-01	+.35699999E+00	+.28799998E+00	+.29478299E+00
79.0	4	+.29674983E+00	+.35322417E-01	+.33099997E+00	+.25799995E+00	+.29425797E+00
80.0	5	+.28439974E+00	+.23736241E-01	+.31499999E+00	+.25599998E+00	+.29373276E+00
81.0	9	+.29752188E+00	+.26642990E-01	+.33199995E+00	+.24599999E+00	+.29320764E+00
83.0	5	+.23619962E+00	+.24651160E-01	+.32399994E+00	+.27899998E+00	+.29215747E+00
85.0	5	+.27959972E+00	+.36282729E-01	+.31399995E+00	+.22099995E+00	+.29110723E+00
86.0	11	+.25930881E+00	+.39376412E-01	+.31499999E+00	+.20399999E+00	+.29058212E+00
88.0	11	+.30209052E+00	+.32194630E-01	+.34799998E+00	+.23399996E+00	+.28953194E+00
90.0	6	+.23323309E+00	+.23316260E-01	+.27649998E+00	+.20609998E+00	+.28848171E+00
92.0	5	+.26745986E+00	+.12184730E-01	+.28349995E+00	+.25099998E+00	+.28743153E+00
93.0	10	+.31879955E+00	+.18317169E-01	+.33999997E+00	+.28899997E+00	+.28690642E+00
98.0	6	+.28089964E+00	+.88132036E-02	+.29079997E+00	+.26739996E+00	+.28428089E+00
103.0	5	+.30021980E+00	+.73251122E-02	+.29789996E+00	+.27669996E+00	+.27902984E+00

ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 1750, CSA 0.1875, 600 PSI, COMPOSITE

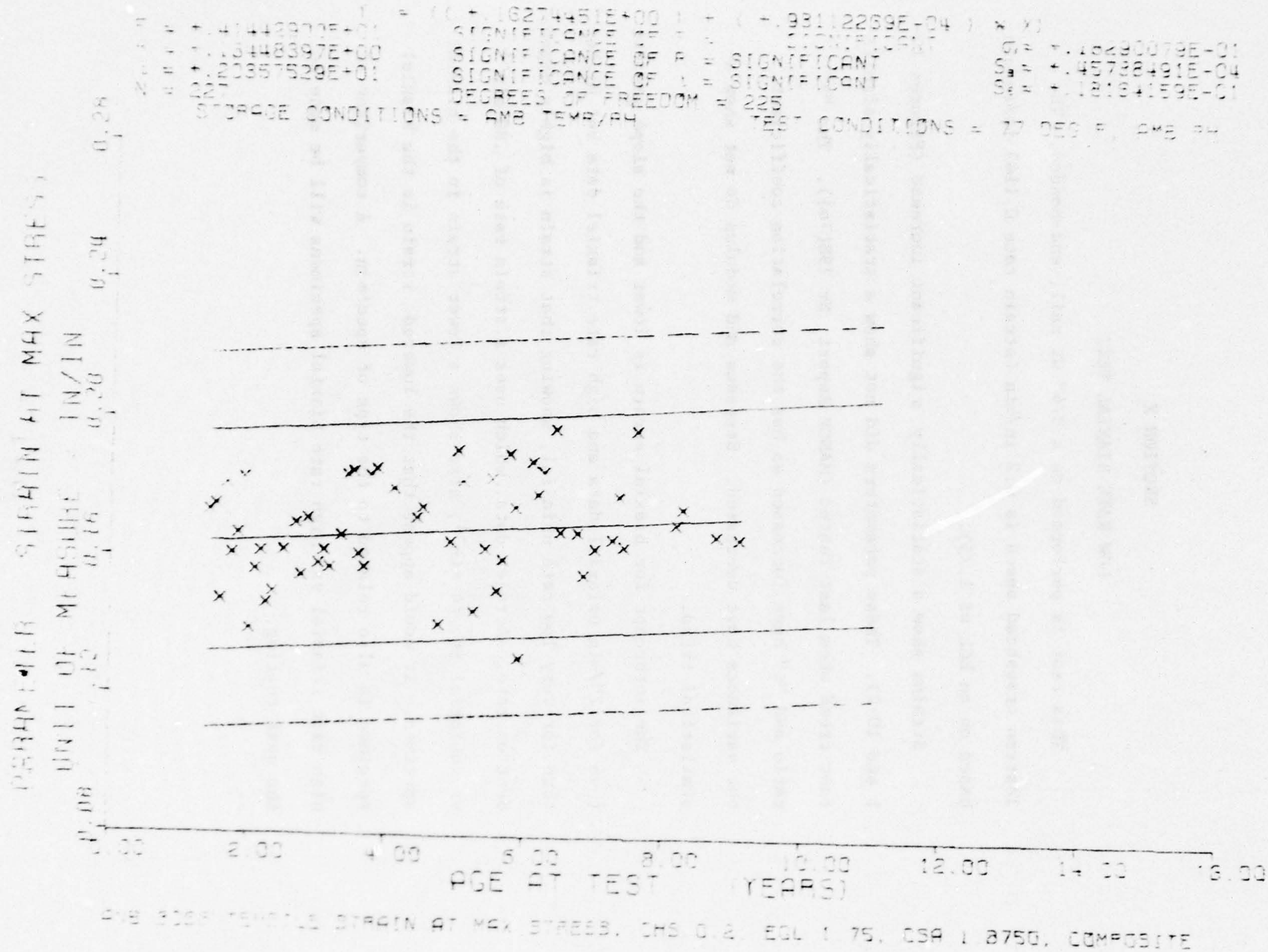
SECTION X

LOW RATE BIAXIAL TEST

This test is performed on a 3/4" GL rail, end-bonded. The Instron crosshead speed is 0.2 in/min (strain rate 0.1143 in/in/min based on an EGL of 1.75).

Strains show a statistically significant increase (Figures 10-1 and 10-2). These parameters did not show a statistically significant trend when last tested (MANCP Report Nr 298(74)). The "F" ratio and "t" have increased as has the correlation coefficient, but variances have decreased. Stresses and modulus do not show a statistical trend.

The intercept for biaxial strain is lower and the slope greater than for 2"/min uniaxial data and high rate triaxial data but higher than for very low rate uniaxial, showing that strain is highly dependent on rate. Aerojet data, which uses a strain rate of .80 min^{-1} vs. uniaxial at .74 min^{-1}, also shows a lower strain in the biaxial specimen. It would appear that the lowered strain in the biaxial specimen is also related to the type of specimen. A comparison of high rate triaxial vs. high rate biaxial specimens will be made at the next testing.



SIGNIFICANCE OF R = SIGNIFICANT
SIGNIFICANCE OF = SIGNIFICANT
DEGREES OF FREEDOM = 225
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = 77 DEG F, AMB RH
PARAMETER STRAIN AT MAX STRESS
UNIT OF MEASURE IN/IN
AGE AT TEST (YEARS)
AMB 3OOP TENSILE STRAIN AT MAX STRESS, CHS 0.2, EGL 1.75, CSA 1.8750, COMPOSITE

FIGURE 10-1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
17.0	6	+.17348319E+00	+.87725333E-02	+.18689996E+00	+.16639995E+00	+.16432738E+00
18.0	8	+.17531228E+00	+.11511738E-01	+.18939995E+00	+.16109997E+00	+.16442048E+00
19.0	2	+.14774996E+00	+.17679003E-02	+.14899998E+00	+.14649999E+00	+.16451358E+00
20.0	5	+.18149995E+00	+.48486596E-02	+.18809998E+00	+.17609995E+00	+.16460675E+00
21.0	5	+.16121995E+00	+.56552671E-02	+.16909998E+00	+.15419995E+00	+.16469985E+00
22.0	3	+.16703724E+00	+.11119522E-01	+.18299996E+00	+.14829999E+00	+.16479295E+00
23.0	3	+.18306660E+00	+.47072323E-02	+.18849998E+00	+.18009996E+00	+.16488605E+00
24.0	4	+.13934993E+00	+.11190004E-01	+.15299999E+00	+.12829995E+00	+.16497915E+00
25.0	2	+.15644997E+00	+.13364822E-01	+.16589999E+00	+.14699995E+00	+.16507226E+00
26.0	6	+.16176658E+00	+.13016174E-01	+.18339999E+00	+.14799994E+00	+.16516542E+00
27.0	2	+.14674997E+00	+.12400516E-03	+.14679998E+00	+.14669996E+00	+.16525952E+00
28.0	2	+.14999997E+00	+.42437301E-02	+.15299999E+00	+.14699995E+00	+.16535162E+00
30.0	4	+.16212493E+00	+.13685329E-01	+.17379999E+00	+.14249998E+00	+.16553783E+00
32.0	4	+.16399995E+00	+.11342961E-01	+.17999994E+00	+.15699994E+00	+.16572409E+00
33.0	8	+.15493738E+00	+.14831775E-01	+.18299996E+00	+.13469994E+00	+.16581720E+00
34.0	2	+.17149996E+00	+.35331914E-02	+.17399996E+00	+.16899996E+00	+.16591030E+00
36.0	6	+.15846663E+00	+.10616618E-01	+.17799997E+00	+.14999997E+00	+.16609650E+00
37.0	2	+.16234993E+00	+.73439933E-02	+.16789996E+00	+.15679997E+00	+.16618961E+00
38.0	6	+.15728324E+00	+.10542146E-01	+.17539994E+00	+.14709997E+00	+.16628277E+00
40.0	2	+.16649997E+00	+.35380939E-02	+.16899996E+00	+.16399997E+00	+.16646897E+00
41.0	2	+.18399995E+00	+.70703807E-02	+.18899995E+00	+.17899996E+00	+.16656208E+00
42.0	2	+.18509995E+00	+.62206529E-02	+.18949997E+00	+.18069994E+00	+.16665518E+00
43.0	4	+.16124993E+00	+.16537667E-01	+.17849999E+00	+.14119994E+00	+.16674828E+00
[illegible]	[illegible]	+.15[illegible]E+00	+.10[illegible]E-01	+.16[illegible]E+00	+.14[illegible]E+00	+.166[illegible]E+00
45.0	2	+.18404996E+00	+.95468350E-02	+.19079995E+00	+.17729997E+00	+.16693454E+00
46.0	2	+.18599992E+00	+.42453343E-02	+.18899995E+00	+.18299996E+00	+.16702765E+00
49.0	6	+.18026649E+00	+.96853382E-02	+.18959999E+00	+.16409999E+00	+.16730695E+00
50.0	6	+.17186653E+00	+.17627728E-01	+.20199996E+00	+.14949995E+00	+.16767942E+00
54.0	2	+.17499995E+00	+.70730450E-02	+.17999994E+00	+.16999995E+00	+.16777253E+00
57.0	4	+.14112496E+00	+.23300850E-01	+.16929996E+00	+.11199998E+00	+.16805189E+00
59.0	2	+.16499996E+00	+.11314604E-01	+.17299997E+00	+.15699994E+00	+.16823810E+00

AND 3066 TENSILE STRAIN AT MAX STRESS, CHS 0.2, EGL 1.75, CSA 1.8750, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
60.0	2	+.19149994E+00	+.35391374E-02	+.19399994E+00	+.18899995E+00	+.16833120E+00
61.0	2	+.18269991E+00	+.14991336E-01	+.19329994E+00	+.17209994E+00	+.16842430E+00
63.0	6	+.14481663E+00	+.74273451E-02	+.15899997E+00	+.13789999E+00	+.16861057E+00
65.0	4	+.16299998E+00	+.93938547E-02	+.17199999E+00	+.14899998E+00	+.16879677E+00
66.0	2	+.18349999E+00	+.35284605E-02	+.18599998E+00	+.18099999E+00	+.16888988E+00
67.0	2	+.15049996E+00	+.14200200E-02	+.15149995E+00	+.14999997E+00	+.16898298E+00
68.0	12	+.15993366E+00	+.93368201E-02	+.16999995E+00	+.14299994E+00	+.16907614E+00
69.0	8	+.19073724E+00	+.23273883E-01	+.22719997E+00	+.14799994E+00	+.16916924E+00
70.0	2	+.17519998E+00	+.31961367E-01	+.19779998E+00	+.15259999E+00	+.16926234E+00
71.0	2	+.13149994E+00	+.21920431E-01	+.14699995E+00	+.11599999E+00	+.16935545E+00
73.0	2	+.18849998E+00	+.91924584E-02	+.19499999E+00	+.18199998E+00	+.16954165E+00
74.0	4	+.17999996E+00	+.61647236E-02	+.18299996E+00	+.16999995E+00	+.16963481E+00
75.0	4	+.18549996E+00	+.14662453E-01	+.20099997E+00	+.17199999E+00	+.16972792E+00
77.0	2	+.19799995E+00	+.84828244E-02	+.20399999E+00	+.19199997E+00	+.16991412E+00
78.0	2	+.16829937E+00	+.11375302E-02	+.16909998E+00	+.16749995E+00	+.17000722E+00
81.0	4	+.16812497E+00	+.55940500E-02	+.17799997E+00	+.15949994E+00	+.17028659E+00
82.0	6	+.15574997E+00	+.28524195E-01	+.19099998E+00	+.11719995E+00	+.17037969E+00
84.0	4	+.16342496E+00	+.11031643E-01	+.17679995E+00	+.15299999E+00	+.17056590E+00
87.0	8	+.16607487E+00	+.13442193E-01	+.19719994E+00	+.13489997E+00	+.17084527E+00
88.0	2	+.17859995E+00	+.94752626E-02	+.18529993E+00	+.17189997E+00	+.17093837E+00
89.0	4	+.16414994E+00	+.14411462E-01	+.17469996E+00	+.14309996E+00	+.17103147E+00
91.0	6	+.19703319E+00	+.90065320E-02	+.20769995E+00	+.18329995E+00	+.17121767E+00
98.0	6	+.17068320E+00	+.73710461E-02	+.18239998E+00	+.16029995E+00	+.17186945E+00
99.0	2	+.17529994E+00	+.17950912E-01	+.18799996E+00	+.16259998E+00	+.17196241E+00
105.0	4	+.15747492E+00	+.12270012E-01	+.17789995E+00	+.15069997E+00	+.17252129E+00
109.0	4	+.16679996E+00	+.83156800E-02	+.17379999E+00	+.15389996E+00	+.17289370E+00

[illegible] 3066 TENSILE STRAIN AT MAX STRESS, CHS 0.2, EGL 1.75, CSA 1.8750, COMPOSITE

Y = ((+.19062481E+00) + (+.13507873E-03) × X)

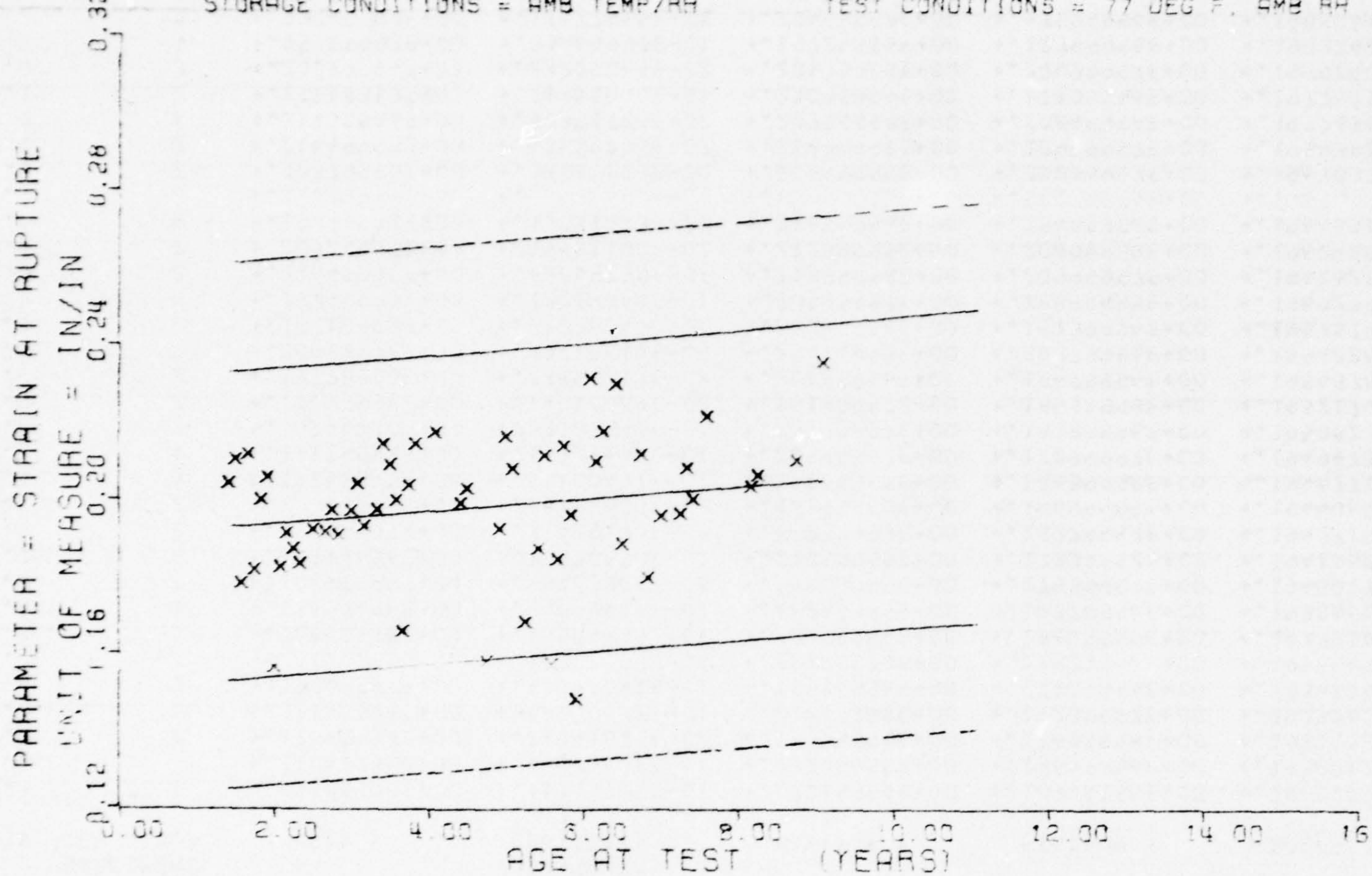
F = +.55620221E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +.22974377E-01

R = +.15531824E+00 SIGNIFICANCE OF R = SIGNIFICANT S_a = +.57275729E-04

t = +.23583939E+01 SIGNIFICANCE OF t = SIGNIFICANT S_e = +.22745950E-01

N = 227 DEGREES OF FREEDOM = 225

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 0.2, EGL 1.75, CSA 1.8750, COMPOSITE

FIGURE 10-2

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
17.0	6	+.20439970E+00	+.11104735E-01	+.22019994E+00	+.18739996E+00	+.19292110E+00
18.0	4	+.21063733E+00	+.17546137F-01	+.23229998E+00	+.18659996F+00	+.19305622F+00
19.0	2	+.17849993E+00	+.21241075E-02	+.17999994E+00	+.17699998E+00	+.19319128E+00
20.0	5	+.21199989E+00	+.14350827E-01	+.22879999E+00	+.19239997E+00	+.19332635F+00
21.0	5	+.18203997F+00	+.10722541E-01	+.19589996E+00	+.17109996E+00	+.19346141E+00
22.0	[illegible]	+.20006227E+00	+.18203509F-01	+.22109997F+00	+.16929996E+00	+.19359654F+00
23.0	3	+.20589995E+00	+.15524436E-01	+.22379994E+00	+.19609999E+00	+.19373160E+00
24.0	4	+.15657496E+00	+.86648865E-02	+.16269999E+00	+.14379996F+00	+.19386667E+00
25.0	2	+.18249994F+00	+.36783963F-02	+.18509995E+00	+.17989999E+00	+.19400173E+00
26.0	6	+.19141656E+00	+.13520570E-01	+.21059995E+00	+.17339998E+00	+.19413685F+00
27.0	2	+.18734997F+00	+.71429170F-02	+.19239997E+00	+.18229997E+00	+.19427192F+00
28.0	2	+.18349999E+00	+.35284605F-02	+.18599998E+00	+.18099999F+00	+.19440698E+00
30.0	4	+.19242495E+00	+.51160437E-02	+.19869995E+00	+.18689996E+00	+.19467717E+00
32.0	4	+.19174993E+00	+.15107640E-01	+.20999997E+00	+.17299997E+00	+.19494730F+00
33.0	8	+.19746220F+00	+.22103540F-01	+.23799997F+00	+.18189996F+00	+.19508236F+00
34.0	2	+.19039998E+00	+.14016689E-02	+.19199997E+00	+.18999999E+00	+.19521743E+00
36.0	6	+.19728326E+00	+.73750253E-02	+.20629996F+00	+.18679994F+00	+.19548761E+00
37.0	2	+.20429992F+00	+.70213619E-03	+.20479995E+00	+.20379996E+00	+.19562268E+00
[illegible]	6	+.19313993E+00	+.1179624[illegible]	+.20229996E+00	+.18139994E+00	+.19575774E+00
40.0	2	+.19749993E+00	+.12019948F-01	+.20599997F+00	+.18899995E+00	+.19602793E+00
41.0	2	+.21449995F+00	+.63639735E-02	+.21899998F+00	+.20999997F+00	+.19616299E+00
42.0	2	+.20924997E+00	+.44531108E-02	+.21239995E+00	+.20609998E+00	+.19629806E+00
43.0	4	+.19999992E+00	+.13801008F-01	+.21659994E+00	+.18439996E+00	+.19643318E+00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+.19656825E+00
45.0	2	+.20374995E+00	+.33865523E-02	+.20649999E+00	+.20099997E+00	+.19670331E+00
46.0	2	+.21449995E+00	+.63639735E-02	+.21899998E+00	+.20999997E+00	+.19683837F+00
49.0	6	+.21759986F+00	+.82891709F-02	+.22799998E+00	+.20849996F+00	+.19724363E+00
53.0	6	+.19918310F+00	+.21851846E-01	+.23099994E+00	+.17109996E+00	+.19778394E+00
54.0	2	+.20299994E+00	+.23229064F-02	+.20409998E+00	+.20099997F+00	+.19791901F+00
57.0	4	+.15829992E+00	+.33864937E-01	+.19729995F+00	+.12799996E+00	+.19832426F+00
59.0	2	+.19249993E+00	+.17677915E-01	+.20499998E+00	+.17999994E+00	+.19859445E+00

ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 0.2, EGL 1.75, CSA 1.8750, COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
60.0	2	+.21649992E+00	+.12019894E-01	+.22499996E+00	+.20799994E+00	+.19872951E+00
61.0	2	+.20809996E+00	+.25738483E-01	+.22629994E+00	+.18989998E+00	+.19886457E+00
63.0	6	+.16839993E+00	+.83693346E-02	+.17599999E+00	+.15399998E+00	+.19913476E+00
65.0	4	+.18749994E+00	+.40372499E-02	+.19099998E+00	+.18199998E+00	+.19940489E+00
66.0	2	+.21149998E+00	+.91899241E-02	+.21799999E+00	+.20499998E+00	+.19953995E+00
67.0	2	+.15749996E+00	+.71747027E-03	+.15799999E+00	+.15699994E+00	+.19967508E+00
[illegible]	12	+.19493306E+00	+.17450043E-01	+.21799999E+00	+.15699994E+00	+.19981014E+00
69.0	8	+.21397459E+00	+.37445977E-01	+.26269996E+00	+.15399998E+00	+.19994521E+00
70.0	2	+.19619995E+00	+.23900235E-01	+.21309995E+00	+.17929995E+00	+.20008027E+00
71.0	2	+.14849996E+00	+.27577484E-01	+.16799998E+00	+.12899994E+00	+.20021539E+00
73.0	2	+.23149996E+00	+.19091357E-01	+.24499994E+00	+.21799999E+00	+.20048552E+00
74.0	4	+.20999997E+00	+.69750516E-02	+.21[illegible]E+00	+.20199996E+00	+.20062059E+00
75.0	4	+.21774995E+00	+.15418351E-01	+.24199998E+00	+.20599997E+00	+.20075571E+00
77.0	2	+.22999995E+00	+.84860303E-02	+.23599994E+00	+.22399997E+00	+.20102584E+00
78.0	2	+.18864995E+00	+.65776664E-02	+.19329994E+00	+.18399995E+00	+.20116090E+00
81.0	4	+.21104996E+00	+.19649841E-01	+.23129999E+00	+.19129997E+00	+.20156615E+00
82.0	6	+.17996665E+00	+.33161945E-01	+.21399998E+00	+.13139998E+00	+.20170122E+00
84.0	4	+.19589996E+00	+.10704983E-01	+.20849996E+00	+.18299996E+00	+.20197141E+00
87.0	8	+.19647479E+00	+.27674512E-01	+.23909997E+00	+.13989996E+00	+.20237660E+00
88.0	2	+.20839995E+00	+.14128517E-02	+.20939999E+00	+.20739996E+00	+.20251172E+00
89.0	4	+.20032495E+00	+.19555335E-01	+.21649998E+00	+.17229998E+00	+.20264679E+00
91.0	6	+.22171640E+00	+.11031379E-01	+.23349994E+00	+.20299994E+00	+.20291692E+00
98.0	6	+.20349970E+00	+.11435439E-01	+.21959996E+00	+.18819999E+00	+.20386248E+00
99.0	2	+.20644992E+00	+.62959569E-02	+.21089994E+00	+.20199996E+00	+.20399755E+00
[illegible]	4	+.21[illegible]E+00	+.10962044E-01	+.22559994E+00	+.20159995E+00	+.20480805E+00
109.0	4	+.23569995E+00	+.32976839E-02	+.23879998E+00	+.23149996E+00	+.20534837E+00

ANB 3066 TENSILE STRAIN AT RUPTURE, CHS 0.2, HSL 1.75, CSA 1.8750, COMPOSITE

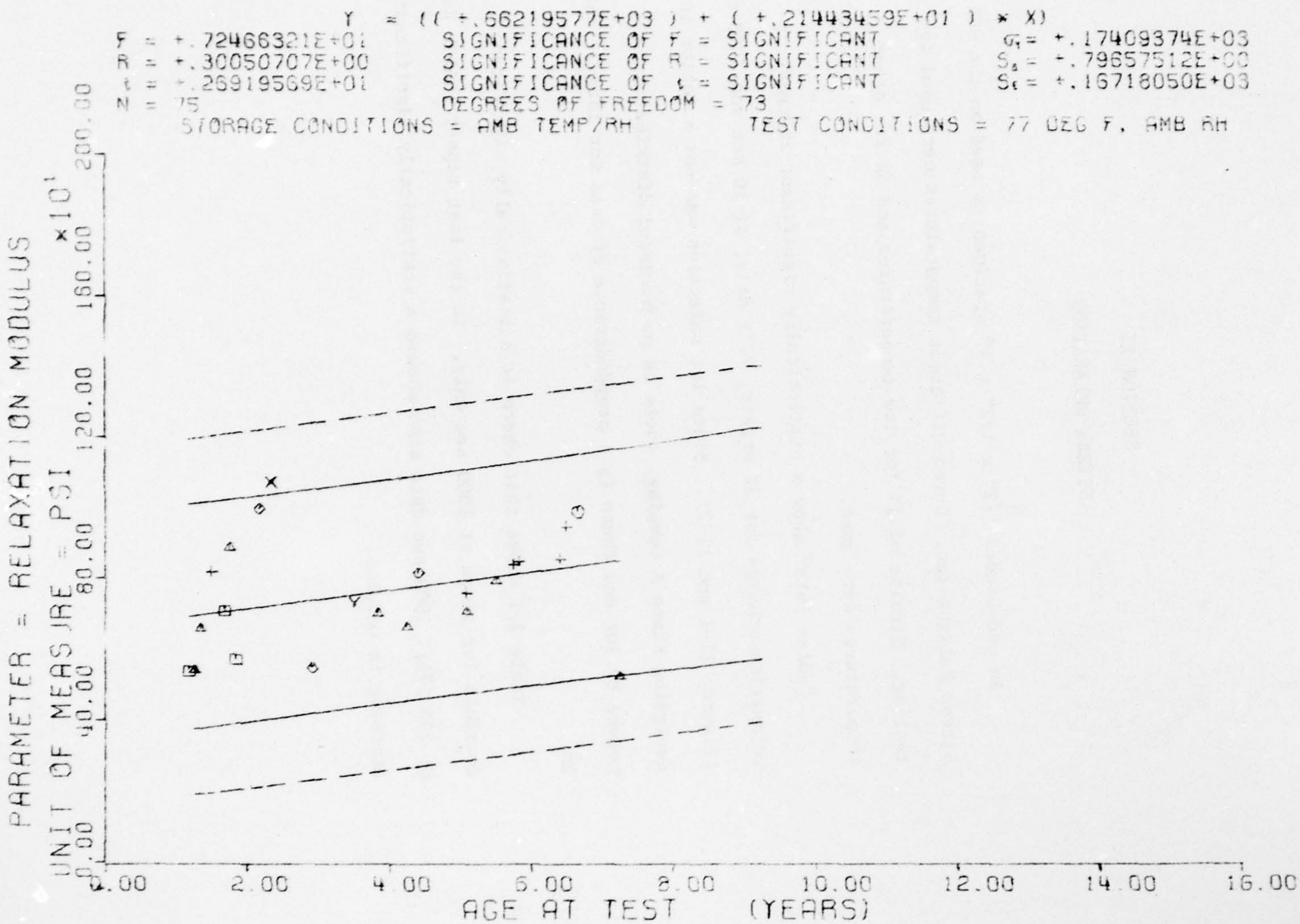
SECTION XI

STRESS RELAXATION

An end-bonded 1/2" x 1/2" x 4" specimen is used on the RCK Stress Relaxometer. Seven different temperatures were used in testing. Strains of 1% for low temperatures and 3% for other temperatures were used.

"Worst lots" show a statistically significant increase in relaxation modulus for 3% strain, 77°F data, at 10 sec and 1000 sec (Figures 11-1 and 11-2). Since lot selection was not a factor in designing Phase A testing, there is no balanced distribution of motors by lot and there is a preponderance of data for lots 27 and 28.

Table 2-1 shows that there is a statistically significant decrease for slope at 1000 sec only. In the last report (MANCP Report Nr 298 (74). 1000 sec data also showed a statistically significant decrease in modulus.



ANB 3066 STRESS RELAXATION MODULUS AT 10 SEC, 3 % STRAIN

FIGURE 11-1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

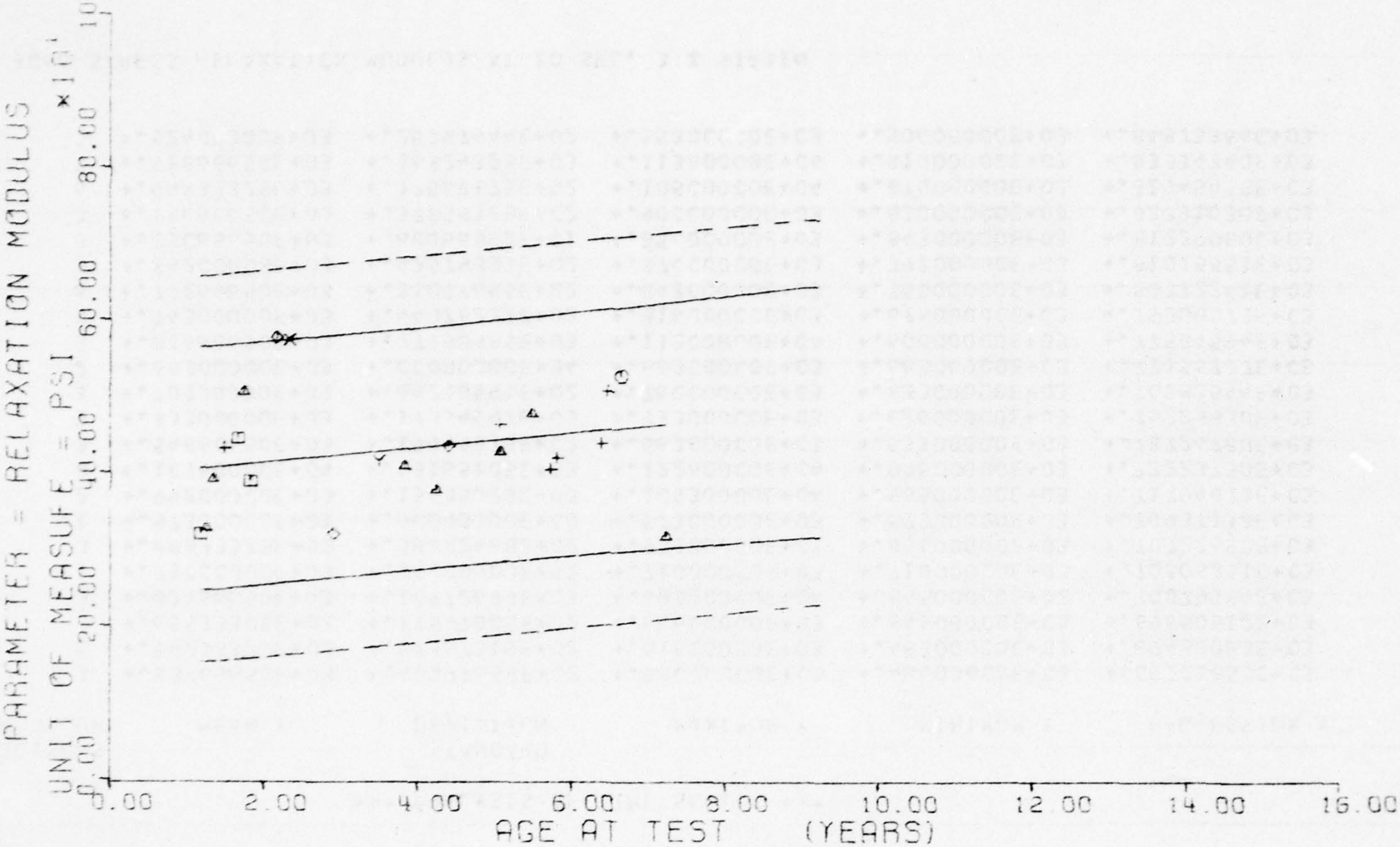
AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
14.0	3	+.53966650E+03	+.48397658E+02	+.58000000E+03	+.48600000E+03	+.69221655E+03
15.0	6	+.54233325E+03	+.57367819E+02	+.61600000E+03	+.48300000E+03	+.69436083E+03
16.0	3	+.65933325E+03	+.11547005E+02	+.66600000E+03	+.64600000E+03	+.69650512E+03
18.0	3	+.82166650E+03	+.18972699E+03	+.10330000E+04	+.66600000E+03	+.70079394E+03
20.0	1	+.71000000E+03	+.00000000E+52	+.71000000E+03	+.71000000E+03	+.70508251E+03
21.0	3	+.88833325E+03	+.38682468E+02	+.93300000E+03	+.86600000E+03	+.70722680E+03
22.0	1	+.57300000E+03	+.00000000E+60	+.57300000E+03	+.57300000E+03	+.70937133E+03
26.0	2	+.99800000E+03	+.13435028E+03	+.10930000E+04	+.90300000E+03	+.71794873E+03
28.0	3	+.10740000E+04	+.13165105E+03	+.12260000E+04	+.99600000E+03	+.72223730E+03
35.0	3	+.54866650E+03	+.15044378E+02	+.56300000E+03	+.53300000E+03	+.73724780E+03
42.0	3	+.73300000E+03	+.17354647E+03	+.93300000E+03	+.62600000E+03	+.75225830E+03
46.0	3	+.70200000E+03	+.64210591E+02	+.76000000E+03	+.63300000E+03	+.76083544E+03
51.0	2	+.66300000E+03	+.00000000E+84	+.66300000E+03	+.66300000E+03	+.77155737E+03
53.0	3	+.81666650E+03	+.27790385E+03	+.11300000E+04	+.60000000E+03	+.77584594E+03
61.0	9	+.74300000E+03	+.44376232E+02	+.81600000E+03	+.67600000E+03	+.79300073E+03
66.0	6	+.79266650E+03	+.31097695E+02	+.84300000E+03	+.75000000E+03	+.80372241E+03
69.0	3	+.84200000E+03	+.42579337E+02	+.87000000E+03	+.79300000E+03	+.81015551E+03
70.0	3	+.85066650E+03	+.68068592E+01	+.85600000E+03	+.84300000E+03	+.81229980E+03
77.0	3	+.85666650E+03	+.37859388E+02	+.90000000E+03	+.83000000E+03	+.82731030E+03
78.0	6	+.94833325E+03	+.77567175E+02	+.10500000E+04	+.87000000E+03	+.82945458E+03
80.0	3	+.98866650E+03	+.16524325E+03	+.11360000E+04	+.81000000E+03	+.83374340E+03
87.0	3	+.52400000E+03	+.25357444E+02	+.55300000E+03	+.50600000E+03	+.84875366E+03

ANB 3066 STRESS RELAXATION MODULUS AT 10 SEC, 3 % STRAIN

Y = ((+ .39433658E+03) + (+ .79131603E-00) × X)

F = +.39347882E+01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +.85367721E+02
R = +.22615141E+00 SIGNIFICANCE OF R = NOT SIGNIFICANT S_b = +.39892318E+00
t = +.19836300E+01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +.83723653E+02
N = 75 DEGREES OF FREEDOM = 73

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 STRESS RELAXATION MODULUS AT 1000 SEC, 3 % STRAIN

FIGURE 11-2

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
14.0	3	+.32066650E+03	+.21361959E+02	+.33300000E+03	+.29600000E+03	+.40541479E+03
15.0	6	+.32800000E+03	+.43881659E+02	+.38300000E+03	+.28300000E+03	+.40620629E+03
16.0	3	+.39200000E+03	+.10583005E+02	+.40000000E+03	+.38000000E+03	+.40699755E+03
18.0	3	+.43400000E+03	+.30199337E+02	+.46600000E+03	+.40600000E+03	+.40858007E+03
20.0	1	+.44600000E+03	+.00000000E+52	+.44600000E+03	+.44600000E+03	+.41016284E+03
21.0	3	+.50633325E+03	+.29365512E+02	+.54000000E+03	+.48600000E+03	+.41095410E+03
22.0	1	+.39000000E+03	+.00000000E+60	+.39000000E+03	+.39000000E+03	+.41174536E+03
26.0	2	+.57800000E+03	+.67882250E+02	+.62600000E+03	+.53000000E+03	+.41491064E+03
28.0	3	+.57500000E+03	+.65825526E+02	+.64600000E+03	+.51600000E+03	+.41649340E+03
35.0	3	+.32166650E+03	+.14011899E+02	+.33300000E+03	+.30600000E+03	+.42203247E+03
42.0	3	+.41633325E+03	+.11581162E+03	+.55000000E+03	+.34600000E+03	+.42757177E+03
46.0	3	+.40933325E+03	+.40414518E+02	+.44600000E+03	+.36600000E+03	+.43073706E+03
51.0	2	+.37800000E+03	+.28284271E+01	+.38000000E+03	+.37600000E+03	+.43469360E+03
53.0	3	+.43666650E+03	+.16258331E+03	+.62000000E+03	+.31000000E+03	+.43627612E+03
61.0	9	+.45255541E+03	+.31571787E+02	+.50300000E+03	+.39300000E+03	+.44260668E+03
66.0	6	+.47733325E+03	+.12516655E+02	+.49600000E+03	+.46300000E+03	+.44656323E+03
69.0	3	+.40633325E+03	+.14224392E+02	+.41600000E+03	+.39000000E+03	+.44893725E+03
70.0	3	+.42166650E+03	+.98149545E+01	+.43300000E+03	+.41600000E+03	+.44972851E+03
77.0	3	+.44000000E+03	+.17320508E+02	+.46000000E+03	+.43000000E+03	+.45526782E+03
78.0	6	+.50833325E+03	+.33714487E+02	+.56000000E+03	+.48000000E+03	+.45605908E+03
80.0	3	+.52733325E+03	+.94479274E+02	+.61300000E+03	+.42600000E+03	+.45764184E+03
87.0	3	+.31733325E+03	+.16239055E+02	+.33600000E+03	+.30600000E+03	+.46318090E+03

ANB 3066 STRESS RELAXATION MODULUS AT 1000 SEC, 3 % STRAIN

SECTION XII

SOL GEL

This test uses a 1/2" cube of propellant. Density is measured using cyclohexane as the reference. Extraction is made with chloroform as the solvent.

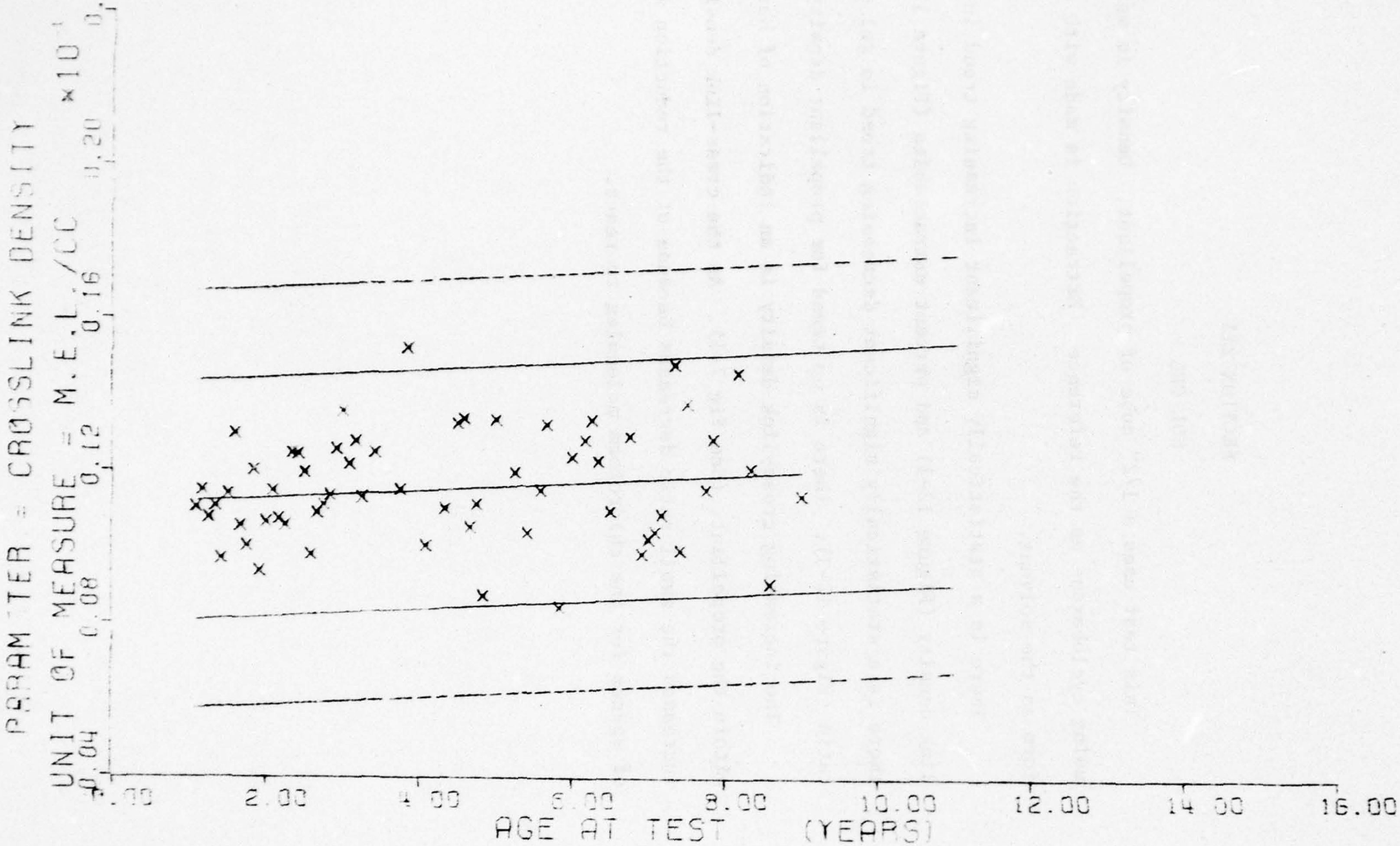
There is a statistically significant increasing trend in cross-link density (Figure 12-1) and percent extractables (Figure 12-2). There is a statistically significant decreasing trend in gel swell ratio (Figure 12-3). There is no trend for propellant density.

The increasing cross-link density is an indication of hardening within the propellant, (See Fig 7-1). As the cross-link density increases the swell ratio decreases because of the reduction in size of spaces for the chloroform molecules to react.

Y = ((+.11106682E-01) + (+.84222202E-05) * Y)

F = +.69239004E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +.18391854E-02
R = +.12243066E+00 SIGNIFICANCE OF R = SIGNIFICANT S_B = +.32007458E-05
t = +.26313305E+01 SIGNIFICANCE OF t = SIGNIFICANT S_E = +.18273541E-02
N = 457 DEGREES OF FREEDOM = 455

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 SCL GEL (CROSSLINK DENSITY), COMPOSITE PLOT

FIGURE 12-1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	4	+.11049997E-01	+.33155625E-03	+.11499997E-01	+.10699998E-01	+.11216171E-01
14.0	8	+.11499993E-01	+.70911131E-03	+.12799996E-01	+.10599996E-01	+.11224590E-01
15.0	8	+.10774984E-01	+.85829918E-03	+.12099999E-01	+.98999999E-02	+.11233013E-01
16.0	16	+.11031229E-01	+.10363343E-02	+.13299999E-01	+.10099999E-01	+.11241436E-01
17.0	4	+.96999965E-02	+.45461157E-03	+.10199997E-01	+.90999975E-02	+.11249858E-01
18.0	12	+.11399973E-01	+.76787090E-03	+.12899998E-01	+.10299999E-01	+.11258281E-01
19.0	8	+.12937479E-01	+.84450781E-03	+.14099996E-01	+.11399999E-01	+.11266704E-01
20.0	8	+.10571241E-01	+.65470493E-03	+.11499997E-01	+.95299966E-02	+.11275123E-01
21.0	20	+.10049477E-01	+.16245784E-02	+.13299997E-01	+.75999982E-02	+.11283546E-01
22.0	8	+.12037485E-01	+.15436856E-02	+.15099998E-01	+.97999982E-02	+.11291969E-01
23.0	4	+.93874968E-02	+.20829906E-03	+.95999985E-02	+.91799981E-02	+.11300392E-01
24.0	12	+.10667148E-01	+.20329271E-02	+.12599997E-01	+.66999979E-02	+.11308815E-01
25.0	3	+.11501237E-01	+.18627635E-02	+.13799998E-01	+.88499970E-02	+.11317238E-01
26.0	8	+.10756991E-01	+.19386639E-02	+.13127997E-01	+.85999965E-02	+.11325657E-01
27.0	3	+.10589998E-01	+.68505179E-03	+.11159997E-01	+.98299980E-02	+.11334080E-01
28.0	4	+.12474995E-01	+.34017413E-03	+.12899998E-01	+.12199997E-01	+.11342503E-01
29.0	8	+.12462481E-01	+.15362994E-02	+.14099996E-01	+.10499998E-01	+.11350926E-01
30.0	7	+.11971414E-01	+.17942511E-02	+.14099996E-01	+.87999999E-02	+.11359348E-01
31.0	4	+.93224990E-02	+.33134979E-03	+.10499998E-01	+.92399977E-02	+.11367768E-01
32.0	4	+.10307996E-01	+.52208755E-03	+.11327996E-01	+.10177999E-01	+.11376190E-01
33.0	12	+.11132482E-01	+.15470828E-02	+.13499997E-01	+.92399977E-02	+.11384613E-01
34.0	8	+.11366240E-01	+.22439638E-02	+.14399997E-01	+.92399977E-02	+.11393036E-01
35.0	8	+.12582726E-01	+.14680981E-02	+.15099998E-01	+.10804999E-01	+.11401459E-01
36.0	4	+.1337[illegible]E-01	+.[illegible]E-03	+.14099996E-01	+.13299997E-01	+.11409882E-01
37.0	8	+.12187480E-01	+.56465964E-03	+.12999996E-01	+.11199999E-01	+.11418301E-01
38.0	8	+.12787491E-01	+.81854853E-03	+.13899996E-01	+.11699996E-01	+.11426724E-01
39.0	12	+.11310730E-01	+.87433511E-03	+.13005997E-01	+.10299999E-01	+.11435147E-01
41.0	4	+.12499995E-01	+.18797061E-02	+.14399997E-01	+.10599996E-01	+.11451993E-01
45.0	4	+.11521495E-01	+.34967152E-03	+.11903997E-01	+.11059999E-01	+.11485680E-01
46.0	4	+.15224996E-01	+.76317805E-03	+.15899997E-01	+.14199998E-01	+.11494103E-01
49.0	3	+.10056234E-01	+.27144950E-03	+.10669998E-01	+.96799992E-02	+.11519368E-01

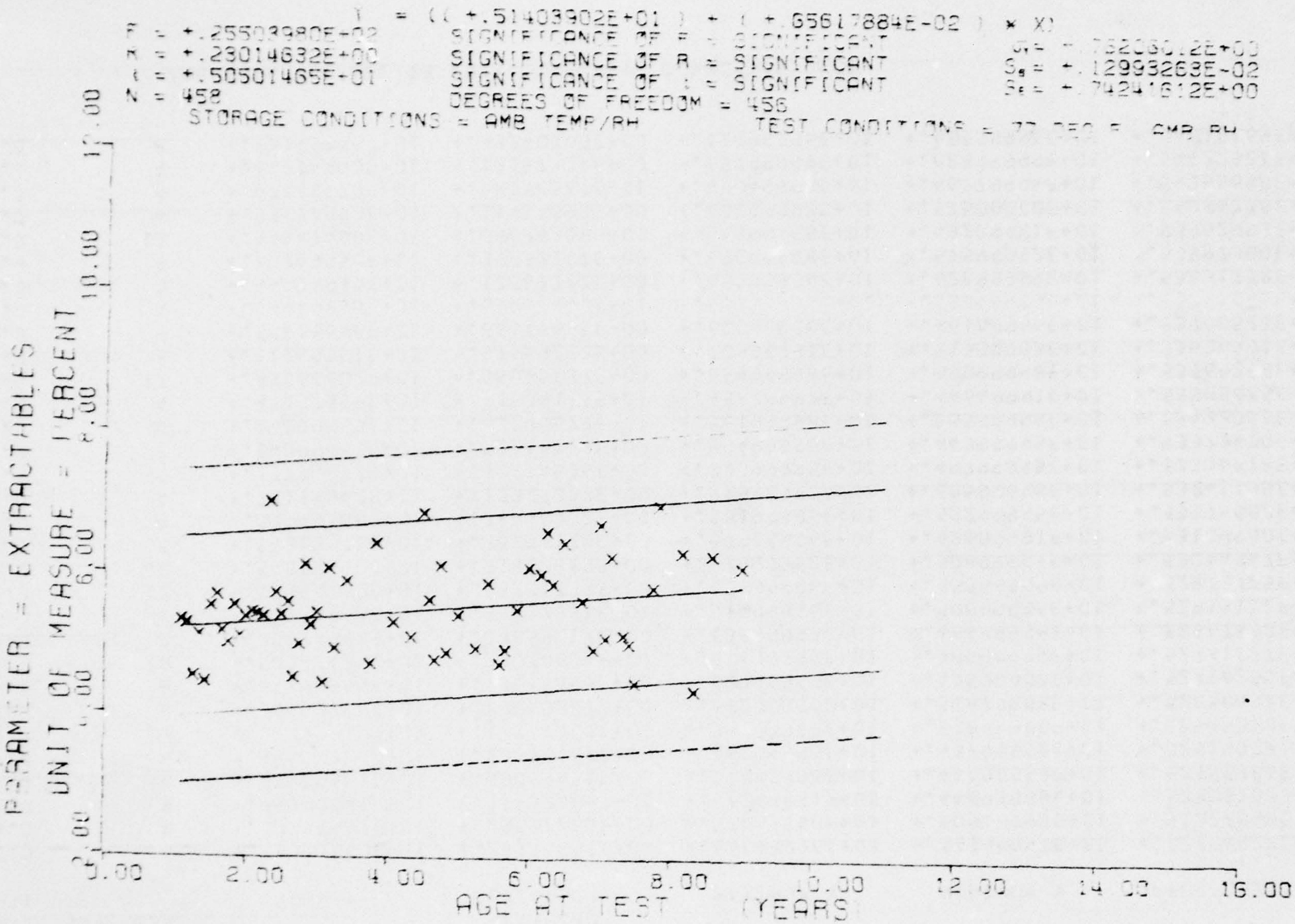
ANB 3066 SOL GEL (CROSSLINK DENSITY), COMPOSITE PLOT

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
52.0	12	+.11024985E-01	+.21284163E-02	+.14099996E-01	+.92999972E-02	+.11544637E-01
54.0	4	+.13249997E-01	+.94339753E-03	+.14099996E-01	+.11899996E-01	+.11561479E-01
55.0	8	+.13377733E-01	+.23080091E-02	+.15899997E-01	+.10560996E-01	+.11569902E-01
56.0	4	+.10527495E-01	+.26702833E-03	+.10779999E-01	+.10149996E-01	+.11578325E-01
57.0	8	+.11136241E-01	+.27919782E-02	+.14399997E-01	+.83099976E-02	+.11586748E-01
[illegible]	4	+.87349973E-02	+.45313106E-03	+.91099999E-02	+.81199966E-02	+.11595170E-01
60.0	4	+.13349998E-01	+.38725885E-03	+.13799998E-01	+.12899998E-01	+.11612012E-01
[illegible]	6	+.11[illegible]67614E-01	+.64758064E-03	+.13199999E-01	+.11099997E-01	+.11637281E-01
65.0	12	+.10337487E-01	+.17553745E-02	+.12899998E-01	+.83099976E-02	+.11654123E-01
67.0	4	+.11499997E-01	+.40816995E-03	+.12099999E-01	+.11199999E-01	+.11670969E-01
68.0	8	+.13231605E-01	+.94147730E-03	+.14480996E-01	+.12320999E-01	+.11679392E-01
70.0	4	+.84424950E-02	+.44587766E-03	+.91099999E-02	+.81999972E-02	+.11696238E-01
72.0	16	+.12375223E-01	+.24404155E-02	+.16099996E-01	+.94999969E-02	+.11713080E-01
74.0	8	+.12824982E-01	+.73980897E-03	+.13999998E-01	+.11299997E-01	+.11729925E-01
75.0	4	+.13349995E-01	+.71411396E-03	+.14099996E-01	+.12599997E-01	+.11738348E-01
76.0	12	+.12270811E-01	+.17461578E-02	+.14599997E-01	+.99899992E-02	+.11746767E-01
78.0	12	+.10958313E-01	+.19515234E-02	+.13799998E-01	+.83999969E-02	+.11763613E-01
81.0	12	+.12922227E-01	+.11062474E-02	+.14197999E-01	+.11099997E-01	+.11788882E-01
83.0	12	+.98391510E-02	+.73476792E-03	+.11259999E-01	+.87199993E-02	+.11805724E-01
84.0	4	+.10224997E-01	+.57373289E-03	+.10699998E-01	+.93999989E-02	+.11814147E-01
[illegible]	12	+.10420817E-01	+.161027[illegible]E-0[illegible]	+.12[illegible]99999E-01	+.81399977E-02	+.11822570E-01
86.0	4	+.10672498E-01	+.19753521E-03	+.11059999E-01	+.10599996E-01	+.11830992E-01
88.0	7	+.14709993E-01	+.11075666E-02	+.16499999E-01	+.12999996E-01	+.11847835E-01
89.0	4	+.99374949E-02	+.32351569E-03	+.10239999E-01	+.95299966E-02	+.11856257E-01
[illegible]	4	[illegible]	+.29536533E-03	+.14187999E-01	+.13505998E-01	+.11864680E-01
93.0	8	+.11532465E-01	+.16571260E-02	+.14599997E-01	+.94499997E-02	+.11889945E-01
94.0	4	+.12349997E-01	+.83458007E-03	+.13799998E-01	+.12099999E-01	+.11898368E-01
98.0	4	+.14588247E-01	+.18815106E-03	+.14785997E-01	+.14332998E-01	+.11932060E-01
100.0	4	+.1207499[illegible]E-01	+.54368123E-03	+.12540999E-01	+.11512998E-01	+.11948902E-01
103.0	4	+.90674981E-02	+.47337971E-03	+.95999985E-02	+.85399970E-02	+.11974170E-01
108.0	4	+.11380497E-01	+.32346463E-03	+.11704999E-01	+.11059999E-01	+.12016281E-01

ANB 3066 SCL GEL (CROSSLINK DENSITY), COMPOSITE PLOT



ANB 3066 SOL GEL (% EXTRACTABLES), COMPOSITE PLOT

FIGURE 12-2

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	4	+.53332443E+01	+.25410091E+00	+.56949996E+01	+.51149997E+01	+.52256927E+01
14.0	8	+.52837467E+01	+.25551268E+00	+.57669992E+01	+.50919990E+01	+.52322549E+01
15.0	8	+.45349941E+01	+.74403866E-01	+.46299991E+01	+.44099998E+01	+.52388162E+01
16.0	16	+.51235561E+01	+.48069451E+00	+.57089996E+01	+.44499998E+01	+.52453784E+01
17.0	4	+.44549980E+01	+.10539907E+00	+.46099996E+01	+.43799991E+01	+.52519397E+01
18.0	12	+.55366242E+01	+.13531800E+00	+.59899997E+01	+.52699995E+01	+.52585020E+01
19.0	8	+.56963729E+01	+.62859287E+00	+.67209995E+01	+.51679992E+01	+.52650632E+01
20.0	8	+.51799964E+01	+.43615698E+00	+.60399999E+01	+.47500000E+01	+.52716255E+01
21.0	20	+.50097427E+01	+.33070624E+00	+.57699995E+01	+.40999994E+01	+.52781877E+01
22.0	8	+.55474949E+01	+.79638017E+00	+.63899993E+01	+.46499996E+01	+.52847490E+01
23.0	4	+.51124992E+01	+.38622851E-01	+.51499996E+01	+.50699996E+01	+.52913112E+01
24.0	12	+.53755760E+01	+.65971797E+00	+.63999996E+01	+.45399999E+01	+.52978725E+01
25.0	8	+.54512443E+01	+.31512813E+00	+.57999992E+01	+.50699996E+01	+.53044347E+01
26.0	8	+.54313678E+01	+.35881170E+00	+.57909994E+01	+.48609991E+01	+.53109960E+01
27.0	4	+.53949966E+01	+.28460882E+00	+.58199996E+01	+.52299995E+01	+.53175582E+01
28.0	4	+.70174942E+01	+.12325382E+00	+.71599998E+01	+.68599996E+01	+.53241195E+01
29.0	8	+.57274932E+01	+.72974536E+00	+.71899995E+01	+.49799995E+01	+.53306818E+01
30.0	7	+.54099969E+01	+.52118039E+00	+.59499998E+01	+.44399995E+01	+.53372430E+01
31.0	4	+.55899963E+01	+.35286679E-01	+.56199998E+01	+.55599994E+01	+.53438053E+01
32.0	4	+.45177459E+01	+.61534111E-01	+.45829992E+01	+.44649991E+01	+.53503665E+01
33.0	12	+.49966602E+01	+.56045837E+00	+.59499998E+01	+.39099998E+01	+.53569288E+01
34.0	8	+.61249961E+01	+.97459232E+00	+.70899991E+01	+.51399993E+01	+.53634901E+01
35.0	8	+.52633686E+01	+.66179661E+00	+.60000000E+01	+.46169996E+01	+.53700523E+01
36.0	4	+.5447[illegible]E+01	+.89437140E-01	[illegible]	+.55899993E+01	+.53766145E+01
37.0	3	+.44474945E+01	+.12843722E+00	+.45999994E+01	+.42899999E+01	+.53831758E+01
38.0	8	+.60749950E+01	+.35832797E+00	+.69099998E+01	+.57599992E+01	+.53897380E+01
39.0	12	+.49447460E+01	+.55824358E+00	+.56999998E+01	+.43209991E+01	+.53962993E+01
41.0	4	+.58974990E+01	+.11414898E+00	+.60099992E+01	+.57500000E+01	+.54094228E+01
45.0	4	+.47189979E+01	+.58356567E-01	+.48049993E+01	+.46779994E+01	+.54355698E+01
46.0	4	+.64274940E+01	+.12157329E+00	+.65799995E+01	+.62899999E+01	+.54422321E+01
49.0	8	+.53149948E+01	+.43340700E+00	+.61099996E+01	+.48599996E+01	+.54619169E+01

ANB 2066 SOL GEL (% EXTRACTABLES), COMPOSITE PLOT

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

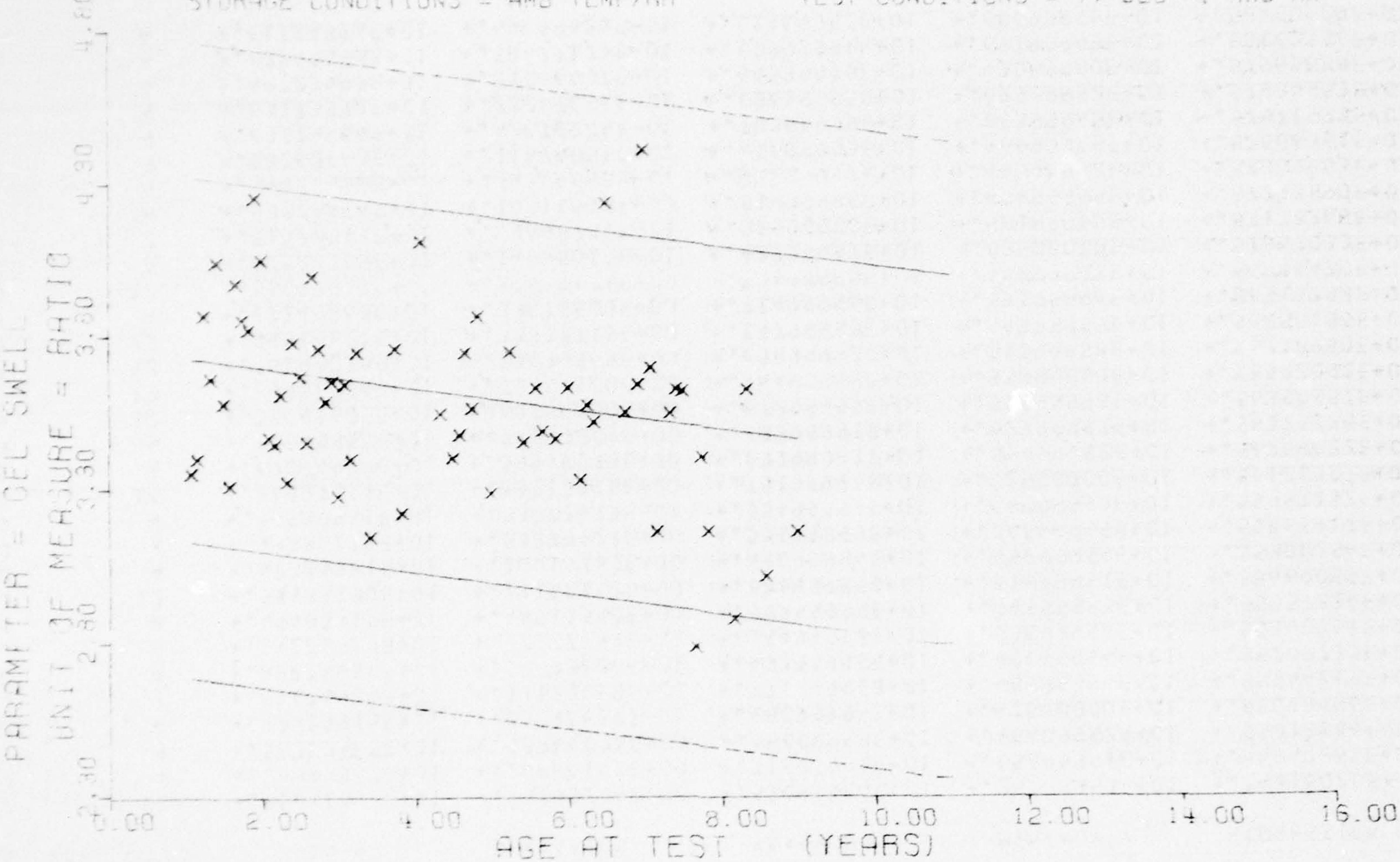
AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
52.0	12	+.51041603E+01	+.86803304E+00	+.57099990E+01	+.26799993E+01	+.54816026E+01
54.0	4	+.68599967E+01	+.24869187E+00	+.71599998E+01	+.65899991E+01	+.54947261E+01
55.0	8	+.56312465E+01	+.93844091E+00	+.68699998E+01	+.46609992E+01	+.55012884E+01
56.0	4	+.47624974E+01	+.23046639E-01	+.48099994E+01	+.47500000E+01	+.55078496E+01
57.0	8	+.61174964E+01	+.13113053E+01	+.77699995E+01	+.48599996E+01	+.55144119E+01
58.0	4	+.48874969E+01	+.57633626E-01	+.49399995E+01	+.48099994E+01	+.55209732E+01
60.0	4	+.54224929E+01	+.37277742E-01	+.54499998E+01	+.53699998E+01	+.55340967E+01
63.0	8	+.49487419E+01	+.44511540E+00	+.55399999E+01	+.44959993E+01	+.55537824E+01
65.0	12	+.53683230E+01	+.29152162E+00	+.62699995E+01	+.51699991E+01	+.55669059E+01
67.0	4	+.47324981E+01	+.10019363E+00	+.48099994E+01	+.45999994E+01	+.55800294E+01
68.0	3	+.49236174E+01	+.53894422E+00	+.53149995E+01	+.36899995E+01	+.55865917E+01
70.0	4	+.54999961E+01	+.33073415E-01	+.55499992E+01	+.54599990E+01	+.55997152E+01
72.0	16	+.61004314E+01	+.65813806E+00	+.75199995E+01	+.52500000E+01	+.56128387E+01
74.0	8	+.60074939E+01	+.33948090E+00	+.67799997E+01	+.55499992E+01	+.56259622E+01
75.0	4	+.66049957E+01	+.27257208E+00	+.68399991E+01	+.62799997E+01	+.56325235E+01
76.0	12	+.53641605E+01	+.60939390E+00	+.67299995E+01	+.51599998E+01	+.56390857E+01
78.0	12	+.64458284E+01	+.76097100E+00	+.74499998E+01	+.55000000E+01	+.56522092E+01
81.0	12	+.56298255E+01	+.50605565E+00	+.65099992E+01	+.51099996E+01	+.56718950E+01
83.0	12	+.49516611E+01	+.32898715E+00	+.54799995E+01	+.44399995E+01	+.56850185E+01
84.0	4	+.67149963E+01	+.33974500E+00	+.71499996E+01	+.63199996E+01	+.56915798E+01
85.0	12	+.51093260E+01	+.17489671E+00	+.52699995E+01	+.46299991E+01	+.56981420E+01
86.0	4	+.62624969E+01	+.14095014E-01	+.62799997E+01	+.62500000E+01	+.57047033E+01
88.0	7	+.51528511E+01	+.90448731E-01	+.52500000E+01	+.50199995E+01	+.57178268E+01
89.0	4	+.50324974E+01	+.10916913E+00	+.51899995E+01	+.49499998E+01	+.57243890E+01
[illegible]	4	+.44622483E+01	+.34304956E-01	+.45229957E+01	+.44509992E+01	+.57309503E+01
93.0	8	+.58262443E+01	+.11674051E+01	+.69699993E+01	+.46999998E+01	+.57506361E+01
94.0	4	+.69874954E+01	+.42072204E-01	+.70399999E+01	+.69399995E+01	+.57571973E+01
98.0	4	+.63179931E+01	+.32297691E-01	+.63619995E+01	+.62929992E+01	+.57834453E+01
100.0	4	+.43727493E+01	+.61066407E-01	+.44539995E+01	+.43089990E+01	+.57965688E+01
103.0	4	+.62849960E+01	+.50477174E-01	+.63399991E+01	+.62199993E+01	+.58162536E+01
108.0	4	+.61124954E+01	+.40689426E-01	+.61469993E+01	+.60699996E+01	+.58490629E+01

HDE 2066 SOL GEL (% EXTRACTABLES), COMPOSITE PLOT

Y = ((+.37644357E+01) + (-.28365592E-02) * X)

F = +.22509999E+02 SIGNIFICANCE OF F = SIGNIFICANT $\bar{Y}$ = +.35318893E+00
R = -.21596999E+00 SIGNIFICANCE OF R = SIGNIFICANT S_a = +.59786771E-03
t = +.47444595E+01 SIGNIFICANCE OF t = SIGNIFICANT S_E = +.34522675E+00
N = 462 DEGREES OF FREEDOM = 460

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



AMB 3060 SOL GEL (GEL SWELL RATIO), COMPOSITE PLOT

FIGURE 12-3

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (UNITS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
13.0	4	+.33523740E+01	+.14771514E-01	+.33678998E+01	+.33324995E+01	+.37275600E+01
14.0	8	+.33384451E+01	+.57120856E-01	+.34990997E+01	+.33295993E+01	+.37247238E+01
15.0	4	+.33675334E+01	+.86837534E-01	+.39867992E+01	+.37646999E+01	+.37218866E+01
16.0	16	+.36597633E+01	+.22740777E+00	+.40564994E+01	+.32307996E+01	+.37190504E+01
17.0	4	+.40412483E+01	+.56651036E-01	+.40850992E+01	+.39959994E+01	+.37162141E+01
18.0	12	+.35709427E+01	+.17582055E+00	+.38428993E+01	+.33707990E+01	+.37133769E+01
19.0	8	+.33110446E+01	+.13951043E+00	+.34586992E+01	+.31559991E+01	+.37105407E+01
20.0	8	+.39721365E+01	+.52130711E-01	+.40538997E+01	+.39024991E+01	+.37077045E+01
21.0	20	+.38536491E+01	+.26411123E+00	+.41779994E+01	+.33490991E+01	+.37048673E+01
22.0	8	+.33209228E+01	+.17951639E+00	+.40290994E+01	+.34514999E+01	+.37020311E+01
23.0	4	+.42551727E+01	+.22631525E+00	+.44676990E+01	+.40203990E+01	+.36991939E+01
24.0	12	+.40493853E+01	+.38534669E+00	+.48613996E+01	+.37666997E+01	+.36963577E+01
25.0	8	+.34693069E+01	+.10362440E+00	+.35956993E+01	+.33462991E+01	+.36935214E+01
26.0	8	+.34430724E+01	+.81822012E-01	+.36101999E+01	+.33894996E+01	+.36906843E+01
27.0	4	+.35105747E+01	+.18505047E-01	+.36368999E+01	+.35940999E+01	+.36878480E+01
28.0	4	+.33263492E+01	+.31737193E-01	+.33574991E+01	+.32832994E+01	+.36850118E+01
29.0	3	+.37306453E+01	+.32061020E+00	+.41012992E+01	+.34739999E+01	+.36821746E+01
30.0	7	+.36699329E+01	+.36834851E+00	+.42453994E+01	+.32232999E+01	+.36793384E+01
31.0	4	+.34555740E+01	+.10132000E-01	+.34673993E+01	+.34432992E+01	+.36765022E+01
32.0	4	+.33467737E+01	+.22300158E-01	+.40175991E+01	+.39651994E+01	+.36736650E+01
33.0	12	+.37605190E+01	+.22356234E+00	+.40806999E+01	+.33328990E+01	+.36708288E+01
34.0	8	+.35530737E+01	+.27515447E+00	+.39643999E+01	+.33255996E+01	+.36679925E+01
35.0	8	+.35322312E+01	+.15627768E+00	+.37830992E+01	+.33784999E+01	+.36651554E+01
36.0	4	+.32775943E+01	+.24332845E-01	+.32939996E+01	+.32412996E+01	+.36623191E+01
37.0	3	+.35442070E+01	+.24928639E-01	+.36733999E+01	+.36117992E+01	+.36594829E+01
38.0	8	+.33991947E+01	+.20167288E+00	+.36592998E+01	+.32039995E+01	+.36566457E+01
39.0	12	+.37477540E+01	+.58783243E-01	+.38559999E+01	+.36651992E+01	+.36538095E+01
41.0	4	+.31443993E+01	+.27032908E-01	+.31713991E+01	+.31115999E+01	+.36481361E+01
45.0	4	+.37615737E+01	+.83717253E-02	+.37731990E+01	+.37505998E+01	+.36367902E+01
46.0	4	+.32242448E+01	+.43749691E-01	+.32865991E+01	+.31645994E+01	+.36339530E+01
49.0	8	+.41117477E+01	+.26245865E+00	+.44163999E+01	+.38580999E+01	+.36254434E+01

ANP 3006 SIL GEL (GEL SWELL RATIO), COMPOSITE PLOT

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
52.0	12	+.33470199E+01	+.34838895E+00	+.40415392E+01	+.31009996E+01	+.36169338E+01
54.0	4	+.34021244E+01	+.12198704E-01	+.34130992E+01	+.33899993E+01	+.36112613E+01
55.0	8	+.34770832E+01	+.33719932E+00	+.38044996E+01	+.31330995E+01	+.36084241E+01
56.0	4	+.37455436E+01	+.94692309E-02	+.37548999E+01	+.37356996E+01	+.36055879E+01
57.0	8	+.35643061E+01	+.24951271E+00	+.38041992E+01	+.33041992E+01	+.36027517E+01
58.0	4	+.38643490E+01	+.10647454E-01	+.38770999E+01	+.38503999E+01	+.35999145E+01
60.0	4	+.32893238E+01	+.11752616E-01	+.32992992E+01	+.32722997E+01	+.35942420E+01
63.0	8	+.37504598E+01	+.10767157E+00	+.39154996E+01	+.36450996E+01	+.35857324E+01
65.0	12	+.34541177E+01	+.20501281E+00	+.37730998E+01	+.32080993E+01	+.35800590E+01
67.0	4	+.36313495E+01	+.22866937E-01	+.36596994E+01	+.36105995E+01	+.35743856E+01
68.0	8	+.34917469E+01	+.22339558E+00	+.37077999E+01	+.32652997E+01	+.35715494E+01
70.0	4	+.34601980E+01	+.84023855E-02	+.34771995E+01	+.34571990E+01	+.35658760E+01
72.0	16	+.35322889E+01	+.40851051E+00	+.44143991E+01	+.32407999E+01	+.35602025E+01
74.0	8	+.33311195E+01	+.23922614E+00	+.35919990E+01	+.30811996E+01	+.35545301E+01
75.0	4	+.35762491E+01	+.13497205E-01	+.36029996E+01	+.35620994E+01	+.35516929E+01
76.0	12	+.35194206E+01	+.10940282E+00	+.36230994E+01	+.33458995E+01	+.35488567E+01
78.0	12	+.42367444E+01	+.50786439E+00	+.49336996E+01	+.35693993E+01	+.35431833E+01
81.0	12	+.35508279E+01	+.21997122E+00	+.38555994E+01	+.32783994E+01	+.35346736E+01
83.0	12	+.36410951E+01	+.13264335E+00	+.38418998E+01	+.34339990E+01	+.35290012E+01
84.0	4	+.44073863E+01	+.18322543E+00	+.46596994E+01	+.42346992E+01	+.35261640E+01
85.0	12	+.36950037E+01	+.13250447E+00	+.38866996E+01	+.35617990E+01	+.35233278E+01
[illegible]	4	+.31530730E+01	+.20356481E-01	+.31877994E+01	+.31388998E+01	+.35204916E+01
88.0	7	+.35473670E+01	+.64987548E-01	+.36038999E+01	+.34663991E+01	+.35148181E+01
89.0	4	+.35262493E+01	+.98861957E-02	+.36380996E+01	+.36172990E+01	+.35119819E+01
90.0	4	+.35201238E+01	+.12900835E-01	+.36381998E+01	+.36070995E+01	+.35091447E+01
92.0	4	+.27876739E+01	+.76708922E+00	+.31802997E+01	+.16370992E+01	+.35034713E+01
93.0	8	+.34030590E+01	+.33855751E+00	+.38174991E+01	+.30251998E+01	+.35006351E+01
94.0	4	+.31620492E+01	+.13815734E-01	+.31764993E+01	+.31348991E+01	+.34977989E+01
98.0	4	+.28772745E+01	+.15330280E-01	+.28941993E+01	+.28565998E+01	+.34864521E+01
100.0	4	+.36252241E+01	+.12983610E-01	+.36361992E+01	+.36083993E+01	+.34807796E+01
103.0	4	+.30144493E+01	+.12719559E+00	+.30908994E+01	+.28242998E+01	+.34722700E+01

AHS 3056 SOL GEL (GEL SWELL RATIO), COMPOSITE PLOT

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
104.0	4	+.31593739E+01	+.27886381E-01	+.31805997E+01	+.31208992E+01	+.34580869E+01

ARS 3066 SOL GEL (GEL SWELL RATIO), COMPOSITE PLOT

AD-A061 373 OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT. LGM-30F, STAGE II, ANB-3066,(U)
SEP 75 E M DALABA

UNCLASSIFIED MANCP-324(75) NL

2 OF 2
AD
A061 373

END
DATE
FILMED
2-79
DDC

SECTION XIII

THERMAL ANALYSIS

Several different tests were run to determine thermal properties. Most did not show any statistically significant trends with age.

a. Thermal Coefficient of Linear Expansion was run on the DuPont 990, TMA attachment 942. TCLE below the glass point shows a statistically significant decrease (Figure 13-1). However, it is the TCLE above glass point which is used in stress analysis and there is no trend in this parameter. There is no trend in glass points.

b. Differential Scanning Calorimetry was run on the Perkin-Elmer DSC-1. A change from manual to computer calculations reveals changes in the total Δ H. Early testing (Phase A, Series I and III) shows marked differences from each other. Further refinements in data acquisition and interpretation will be required to determine if these are significant trends.

c. Ignitability is done using a .050" wafer in the Arc Image Furnace at a flux density of 168 $\pm$ 5 cal/cm^2 sec. There is no statistically significant trend over three years of testing.

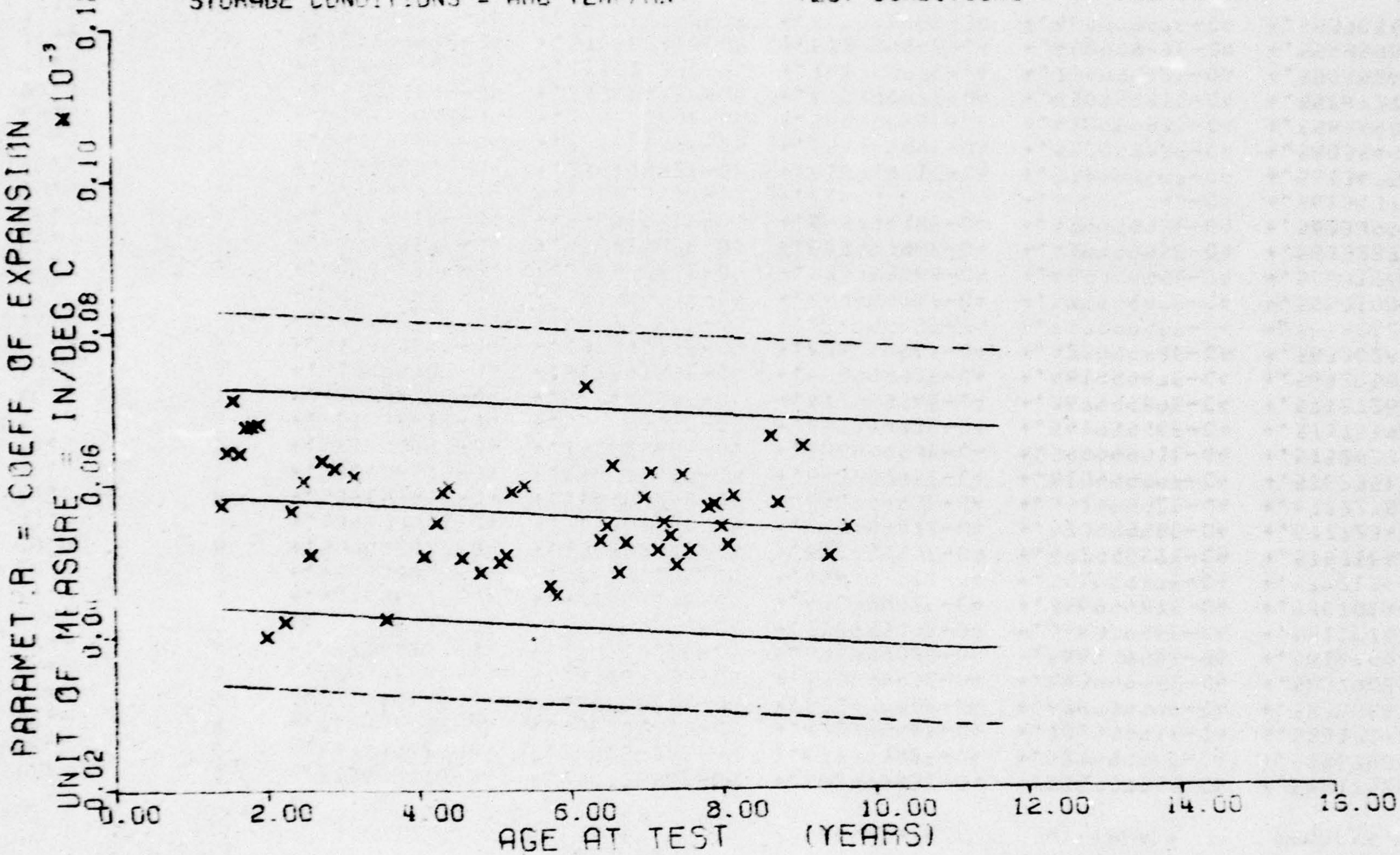
d. Burning rate data are obtained from burning strands with 500 psi nitrogen pressure. There is no statistically significant trend over three years of testing.

e. Pressure Time is run on a 5 gram specimen using a high pressure Parr Bomb (500 psi initial nitrogen pressure). There are no significant changes.

Minimal changes in thermal stability are present, but correlation of these changes with structural integrity has not been determined.

Y = ((+.50281167E-04) + (-.49825524E-07) × X)

F = +.77026440E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +.82692815E-05
R = -.17390144E+00 SIGNIFICANCE OF R = SIGNIFICANT S_a = +.17880727E-07
t = +.27753637E+01 SIGNIFICANCE OF t = SIGNIFICANT S_e = +.81597507E-05
N = 249 DEGREES OF FREEDOM = 247
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



ANB 3066 THERMAL COEFFICIENT OF LINEAR EXPANSION (**ABOVE** GLASS POINT), COMPOSITE

FIGURE 13-1

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (DAYS)	SPECIMENS TESTED	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
17.0	3	+.57366647E-04	+.25577360E-05	+.60299993E-04	+.55599986E-04	+.58417528E-04
18.0	6	+.64344922E-04	+.30963924E-05	+.67799992E-04	+.58799996E-04	+.58367906E-04
19.0	3	+.71266651E-04	+.90637181E-06	+.72099996E-04	+.70299996E-04	+.58318270E-04
20.0	3	+.64133317E-04	+.10592627E-05	+.65099986E-04	+.62999999E-04	+.58268647E-04
21.0	3	+.67066653E-04	+.23916933E-05	+.69899993E-04	+.64399995E-04	+.58219025E-04
22.0	3	+.67733330E-04	+.17031221E-05	+.69699992E-04	+.66699998E-04	+.58169403E-04
23.0	3	+.[illegible]5739E-04	+.23737458E-05	+.71299989E-04	+.64499996E-04	+.58119767E-04
24.0	3	+.40166647E-04	+.47365312E-05	+.43099993E-04	+.34699987E-04	+.58070145E-04
27.0	3	+.42033423E-04	+.47647920E-05	+.45499997E-04	+.36599987E-04	+.57921264E-04
28.0	6	+.55533283E-04	+.42836247E-05	+.61099999E-04	+.49299997E-04	+.57871642E-04
30.0	3	+.60499995E-04	+.31430244E-05	+.63299987E-04	+.57099998E-04	+.57772398E-04
31.0	6	+.50316641E-04	+.11449329E-04	+.64099993E-04	+.39199992E-04	+.57722761E-04
32.0	3	+.63166662E-04	+.13007647E-05	+.64399995E-04	+.61099999E-04	+.57623517E-04
35.0	3	+.62166654E-04	+.19292666E-05	+.63699990E-04	+.59999991E-04	+.57524273E-04
38.0	3	+.61166661E-04	+.55669979E-05	+.65999993E-04	+.54899996E-04	+.57375393E-04
43.0	3	+.42399988E-04	+.52847069E-05	+.47299996E-04	+.36799989E-04	+.57127268E-04
49.0	3	+.53599992E-04	+.51739159E-05	+.56299992E-04	+.46199987E-04	+.56829507E-04
51.0	3	+.54933319E-04	+.10944074E-04	+.62599996E-04	+.42399988E-04	+.56730263E-04
[illegible]	[illegible]	+.[illegible]	+.[illegible]	+.63499983E-04	+.54799995E-04	+.56580626E-04
[illegible]	[illegible]	+.59699945E-04	+.66134083E-05	+.66999986E-04	+.47999987E-04	+.56631004E-04
55.0	3	+.50333323E-04	+.30549223E-05	+.52099996E-04	+.46999994E-04	+.56531760E-04
58.0	3	+.48333313E-04	+.45091968E-05	+.52999996E-04	+.43999985E-04	+.56382879E-04
61.0	6	+.49766618E-04	+.59051901E-05	+.55999988E-04	+.42999992E-04	+.56233999E-04
[illegible]	[illegible]	+.[illegible]	+.[illegible]	+.[illegible]	+.45099994E-04	+.56184377E-04
63.0	3	+.59766659E-04	+.25460472E-05	+.61899991E-04	+.57299999E-04	+.56134755E-04
65.0	3	+.[illegible]	+.72189182E-05	+.68699995E-04	+.53799987E-04	+.56035498E-04
[illegible]	[illegible]	+.[illegible]	+.27080220E-05	+.50999995E-04	+.43099993E-04	+.55836993E-04
70.0	3	+.45333319E-04	+.23092461E-05	+.47999987E-04	+.43999985E-04	+.55787371E-04
[illegible]	3	+.727[illegible]	+.12751622E-05	+.74199997E-04	+.71699992E-04	+.55539247E-04
77.0	3	+.52499992E-04	+.37658041E-05	+.57299999E-04	+.46099987E-04	+.55439988E-04
[illegible]	[illegible]	+.[illegible]	+.[illegible]	+.60[illegible]E-04	+.46799992E-04	+.55390366E-04

ANB 3066 THERMAL COEFFICIENT OF LINEAR EXPANSION (ABOVE GLASS POINT), COMPOSITE

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS OF [illegible]	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
79.0	6	+.62303533E-04	+.37607496E-05	+.65399996E-04	+.56999994E-04	+.55340744E-04
80.0	3	+.48333313E-04	+.13274266E-05	+.49999987E-04	+.46999994E-04	+.55291122E-04
81.0	9	+.52177640E-04	+.66205286E-05	+.63599989E-04	+.44999993E-04	+.55241485E-04
84.0	3	+.5[illegible]31E-04	+.18187427E-05	+.60199992E-04	+.56999997E-04	+.55092619E-04
85.0	3	+.61366643E-04	+.28358293E-05	+.63199986E-04	+.58099991E-04	+.55042997E-04
86.0	3	+.51266644E-04	+.61239834E-05	+.55799938E-04	+.44299988E-04	+.54993361E-04
87.0	12	+.54099923E-04	+.54743172E-05	+.62199793E-04	+.44999993E-04	+.54943739E-04
88.0	6	+.53133306E-04	+.65893541E-05	+.60199992E-04	+.44999993E-04	+.54894117E-04
89.0	9	+.49233326E-04	+.63930650E-05	+.59199999E-04	+.42999992E-04	+.54844495E-04
90.0	6	+.61066580E-04	+.53695475E-05	+.65599991E-04	+.53399999E-04	+.54794858E-04
91.0	6	+.51166247E-04	+.65573822E-05	+.60099991E-04	+.40999992E-04	+.54745236E-04
94.0	9	+.56777716E-04	+.64687665E-05	+.69099967E-04	+.48999994E-04	+.54596355E-04
95.0	3	+.57199984E-04	+.33201301E-05	+.59999991E-04	+.53999989E-04	+.54546733E-04
96.0	9	+.54233256E-04	+.53155893E-05	+.66399996E-04	+.44399988E-04	+.54497111E-04
97.0	3	+.51799986E-04	+.42884217E-05	+.55499986E-04	+.47099994E-04	+.54447489E-04
98.0	5	+.58299973E-04	+.75985223E-05	+.67499980E-04	+.49999987E-04	+.54397853E-04
104.0	3	+.56033317E-04	+.37256158E-05	+.63299996E-04	+.51499988E-04	+.54100106E-04
105.0	12	+.57349883E-04	+.63187546E-05	+.66199994E-04	+.48499990E-04	+.54050484E-04
[illegible]	[illegible]	+.[illegible]	+.[illegible]	+.[illegible]	+.42799997E-04	+.53951981E-04
[illegible]	[illegible]	+.[illegible]	+.57672539E-05	+.59599988E-04	+.40299936E-04	+.53553478E-04
116.0	3	+.54099983E-04	+.43863402E-05	+.58899997E-04	+.50299990E-04	+.53504598E-04

[illegible] THERMAL COEFFICIENT OF LINEAR EXPANSION (ABOVE GLASS POINT), COMPOSITE

SECTION XIV

CHARACTERIZATION TESTING

One carton was chosen for further testing based on the mean values of Low Rate Tensile data. This so-called characterization testing relates some properties not studied in depth in regular testing. Failure envelope, relating strain rates and temperature to tensile parameters, is one test. Poisson's ratio, a measure of dilatation is another. Characteristic Tear Energy is a fairly new measure of cohesive energy. The carton chosen was from Lot 27, AA20546. Data are presented in tabular form in Table 14-1 through 14-4.

1. Thermal Coefficient of Linear Expansion data are shown below and above the glass point. These data are similar to other TCLE data for this lot (Table 14-2).

2. Poisson's ratio was determined using the RCK gas dilatometer. Dilatation is small below 10% strain (Table 14-2).

3. The temperature corrected failure envelope as drawn by the computer does not show the characteristic shape observed in other propellants. Another carton from the same lot was selected and a second failure envelope run which was also uncharacteristic. The variability in the data from the two cartons at a given temperature and crosshead speed is sufficient to explain the differences in the curves of the two failure envelopes (Figures 14-1 and 14-2 and Table 14-3).

4. Two types of specimens were used for Characteristic Tear Energy. One type developed by Thiokol, uses a 5" x 1.68" x 3/8" rectangle bonded to wooden tabs with a centrally located slit. The equation used to calculate tear energy is $c = Kd^2E_R$ where:

c = Characteristic tear energy

k = Constant for specimen configuration = .222

d^2 = Crosshead displacement at initial cracking

E_R = Relaxation Modulus taken from master stress relaxation curve where E_R vs log t/aT is computed for each temperature and t is time in seconds for crosshead travel.

The second type, developed by Lockheed, uses a smaller propellant sample, 3" x 1" x 0.1" with a 0.50" slit at the edge and bonded to wooden end tabs. The equation used to calculate tear energy for this type of specimen is $c = .187 \quad h/100$

where: c = Critical stress = $\frac{Fc}{(W-R)t}$

= Critical Strain

Fc = Critical load

W = Sample width

K = Cut length

t = Sample thickness

L = Sample gage length

Data from both types of specimens are given for 77°F testing

(Table 14-4). It is obvious from these limited data that characteristic tear energy is dependent upon crosshead speed and type of specimen.

This limited testing does not show trends, since the carton tested was an average one. In the future "worst lots" will be used to evaluate propellant characteristics for aging trends.

TABLE 14-1

TCLE

Glass Point	Before T_g	After T_g
T_g, °C	$X10^{-5}$ °C^{-1}	$X10^{-5}$ °C^{-1}
-78	5.41	7.42
-74	4.25	7.25
-77	4.00	7.17

TABLE 14-2

Poissons Ratio

5%	15%	18.75
.448	.388	
.447		.386
.447		.378

TABLE 14-3

Failure Envelope

	Temperature	Crosshead Speed	Strain @ Rupture	Stress @ Rupture
AA 20546	-40°F	0.02	.170	232
			.187	237
			.199	229
		0.2	.237	289
			.231	301
			.206	289
AA 20545		0.2	.256	555
			.272	546
			.271	561
AA 20546		2.0	.282	361
			.239	387
			.211	384
AA 20545		2.0	.265	367
			.314	362
			.276	360
AA 20546	20°F	0.2	.208	163
			.233	160
			.208	160
AA 20545		0.2	.249	126
			.256	156
			.247	160
AA 20546		2.0	.241	198
			.209	203
			.205	207
AA 20545		2.0	.252	192
			.297	181
			.286	186
AA 20546		20.0	.334	235
			.215	266
			.216	265
AA 20545		20.0	.261	241
			.311	230
			.285	236
AA 20546	77°F	0.02	.215	104
			.204	104
			.214	104
		0.2	.242	112
			.241	112
			.238	112
AA 20545		0.2	.274	138
			.234	115
			.285	112

TABLE 14-3 (Cont.)

Failure Envelope

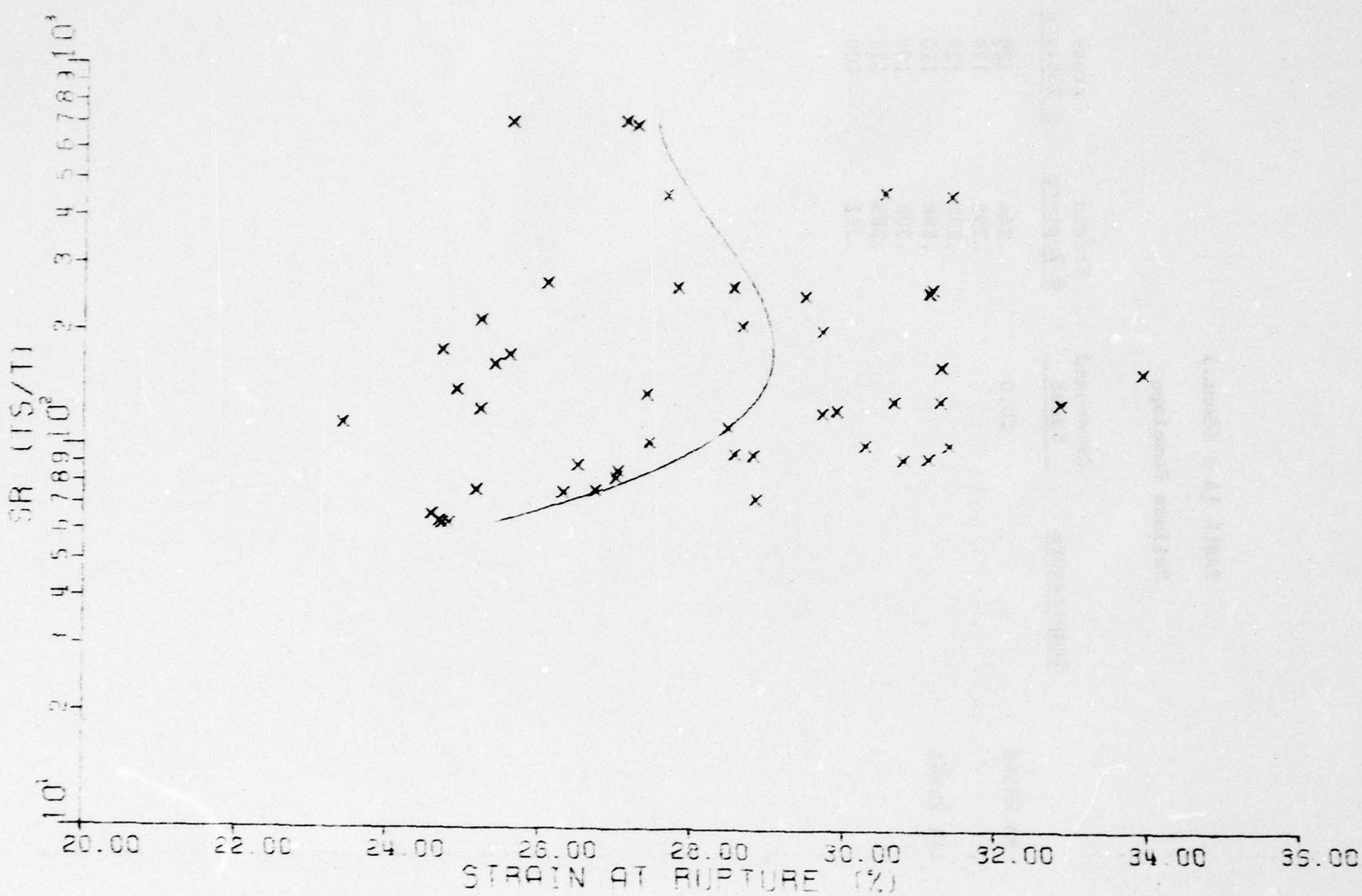
	Temperature	Crosshead Speed	Strain @ Rupture	Stress @ Rupture
AA 20546		2.0	.271	133
			.282	124
			.253	132
AA 20545		2.0	.328	132
			.313	134
			.306	133
AA 20546		20.0	.293	167
			.288	155
			.300	150
AA 20545		20.0	.313	165
			.254	166
			.339	159
AA 20546	120°F	0.2	.186	104
			.190	105
			.260	96
AA 20545		0.2	.265	97
			.270	93
			.270	89
AA 20546		2.0	.252	124
			.275	124
			.252	125
AA 20545		2.0	.303	110
			.314	111
			.274	111
AA 20546		20.0	.258	149
			.259	150
			.309	147
AA 20545		20.0	.299	136
			.273	132
			.297	138
AA 20546	160°F	0.2	.223	92
			.204	86
			.194	91
AA 20545		0.2	.247	73
			.247	72
			.248	72
			.246	76
AA 20546		2.0	.249	109
			.236	111
			.209	111
AA 20545		2.0	.252	87
			.263	87
			.288	84
			.267	88

TABLE 14-3 (Cont.)

Failure Envelope

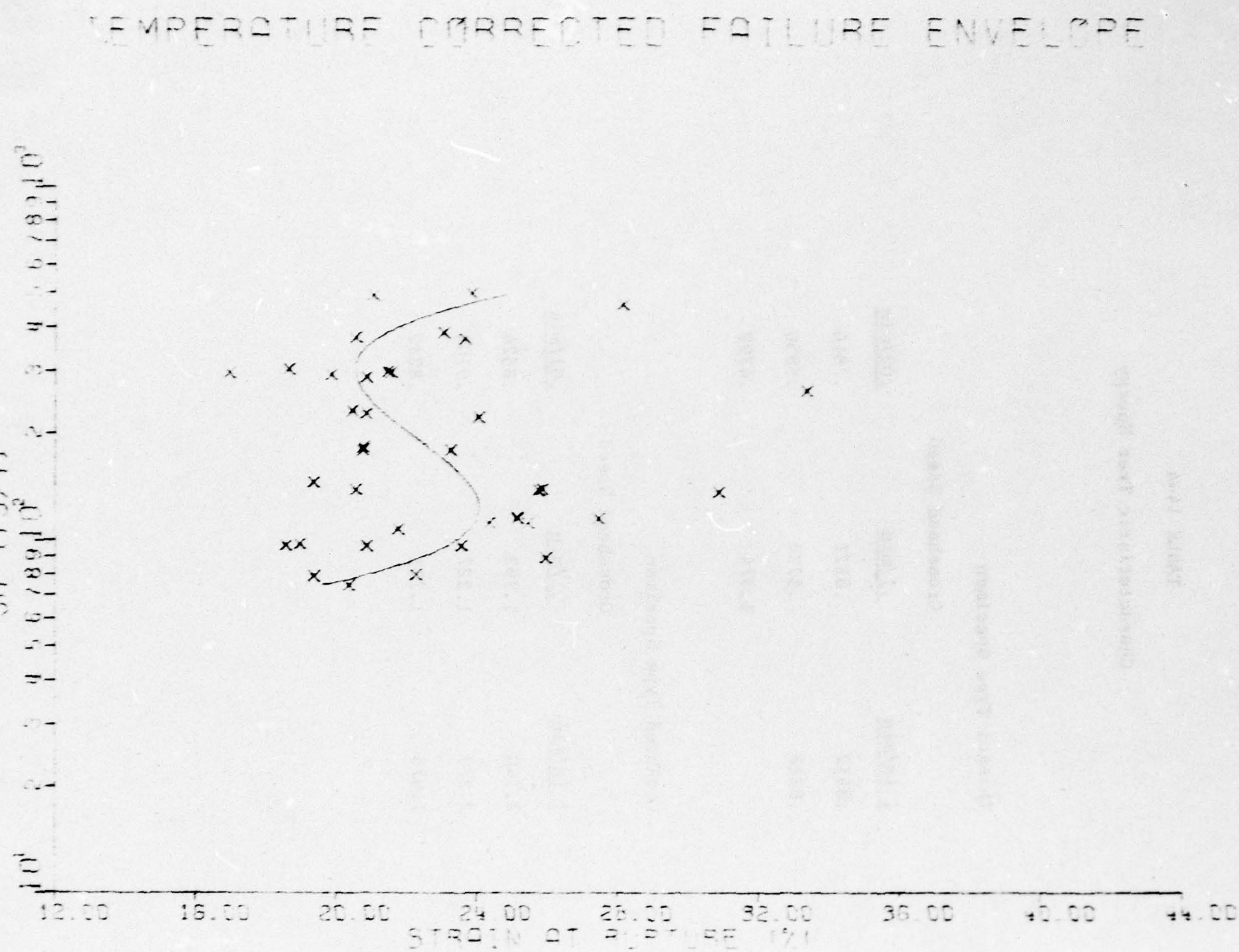
	Temperature	Crosshead Speed	Strain @ Rupture	Stress @ Rupture
AA 20546		20.0	.244	129
			.255	129
			.218	124
AA 20545			.288	110
			.308	108
			.286	111
			.311	109

TEMPERATURE CORRECTED FAILURE ENVELOPE



ANB 3066 TEMPERATURE CORRECTED FAILURE ENVELOPE, MTR S/N 0020545

Figure 14-1



ANB 3066 PROPELLANT TEMPERATURE CORRECTED FAILURE ENVELOPE, MTR S/N AA20E46

Figure 14-2

TABLE 14-4

Characteristic Tear Energy

Thiokol Type Specimen

Crosshead Speed		
1 in/min	.1/min	.02/min
.8512	.8521	.7816
.8218	.5729	.5850
	1.374	.4798

Lockheed Type Specimen

Crosshead Speed		
1 in/min	.1/min	.01/min
2.140	1.393	.8524
2.279	1.227	.9102
1.975	1.231	.8232

APPENDIX A

LINED CARTONS

A. STATISTICAL APPROACH.

Lined propellant cartons prepared by Aerojet were tested for the first time in 1974. Propellant used in these 9" x 9" x 9" cartons represented five different lots, only two of which were represented in the unlined cartons. The data for lined and unlined cartons were stratified into two groups and statistically analyzed to define any significant within-group and among-group differences.

The following procedures were followed in these analyses:

1. Bartlett's Chi-square test was used to test for homogeneity of variance within each group. The computed X^2 for the lined and unlined groups were 2.2297 and 2.6822 respectively. These values tested at $\alpha = .05$ were not significant, indicating homogeneous variance within each group.

2. A standard F test at $\alpha = .05$ was used to determine if there was any significant difference of variance between groups. Data from lots 49 and 59 covering the age span of 21-23 months were used in this test. The computed F value of 2.9855 was greater than the critical value of 2.45 ($\alpha = .05$), and indicated a significant difference between the variances of the two groups.

3. Because there were significant group-to-group variances, a modified "t" test was performed to determine whether the group means

were similar. This test makes use of a computed critical value of "t":

$$t_{critical} = \frac{t_1(S_1^2/n_1) + t_2(S_2^2/n_2)}{S_1^2/n_1 + S_2^2/n_2}$$

where t_1 and t_2 are the tabular t values for each group respectively and determined at an appropriate confidence level and degrees of freedom:

$$t_1 = t_{(1-\alpha/2)}\ (n_1-1)$$

$$t_2 = t_{(1-\alpha/2)}\ (n_2-1)$$

S_1^2 and S_2^2 are the respective group variances. The computed t statistic of 3.443 exceeds the critical value of 2.279 which indicates a significant difference between group means.

Lined carton data is significantly different from the unlined carton data as shown in Table A-1.

The brief age span (six months) precludes regression analysis. The data are tabulated in this report for reference.

B. TEST METHODS.

Test methods are the same as those used for unlined cartons except for tests related to the liner bonds. Liner bond tests are hydrostatic bond shear and constant load tensile and shear.

C. TEST DATA.

Motor serial numbers, lot numbers and dates of manufacture are

shown in Table A-2. Other data are shown in Tables A-3 through A-10.

D. DISCUSSION OF TEST RESULTS.

1. Low Rate Tensile.

There are both within-lot and lot-to-lot differences with lot 54 showing the lowest strains and the highest stresses and moduli. The strain values of this lot are consistent with all lots, but the values for lots 50, 52 and 53 are much higher. See Table A-3 and compare with summary sheets in Section IV.

2. Very Low Rate Tensile.

For this test as for low rate tensile lot 54 shows the lowest average strains and highest average stresses. See Table A-4.

3. Low Rate Biaxial Tensile.

Lot 54 holds the same relative position for all parameters. See Table A-5.

4. High Rate Hydrostatic Tensile.

Although the modulus for lot 50 is higher than for lot 54, the other parameters show that the relative position for this lot is the same. See Table A-6.

5. Stress Relaxation.

The master stress relaxation curve for all lots is shown in Figure A-1. Lot 54 shows the highest relaxation modulus, although AA21015 has the highest modulus at 77°F. The rankings of individual

blocks varies at different temperatures.

6. Hardness.

Lot 54 has the highest hardness and lot 52 the lowest (Table A-7).

7. Tear Energy.

The data for Lockheed type specimens are given in Table A-8. It is obvious from these data that the pattern for an increase in tear energy with higher rates is present, but it is not wholly consistent. Changes with temperature are neither apparent nor as consistent.

8. DSC.

These data are similar to data for the unlined cartons and are shown in Table A-9. (See Section XIIIb.)

9. TCLE.

The TCLE both above and below Tg appears to be higher than for unlined cartons (Table A-10). Lots 50 and 53 appear to be more consistent than Lots 52 and 54.

10. Case Liner Bonds

In many cartons the liner is so irregular that there is deep penetration into the propellant. Figures A-2 and A-3 show the irregularities in the bond line. The worst case is AA21082 where the liner extended 0.2 in into the propellant. For these specimens propellant was cut 0.3 in.

a. Hydrostatic Shear.

Specimens were tested on the MTS at 100 in/min with 600 psi nitrogen pressure. Several adhesive-to-end tab failures occurred, and there were several other instances of secondary adhesive failure. Data are given in Table A-11.

b. Constant Load Shear and Tensile

These specimens were stored at 20°F for four months, then at 0°F for four months before bonding. Several weeks elapsed before all specimens were tested.

(1) Shear

Only eight specimens were tested at 20 psi. Of these, three were discontinued before break. Table A-12 shows the actual stress and time to failure. Those specimens which had pink liners showed varying degrees of tackiness. This means that when the halves were placed together with slight pressure, a greater force to separate them was required than was used in rejoining them.

(2) Tensile.

Data are shown in Table A-13. As with the shear specimens, many showed some tackiness.

Those specimens which had buff-colored liner did not exhibit tackiness between liner and propellant although there was a slight stickiness in the liner itself if the liner was thick.

E. CONCLUSIONS

Until more data has accrued, no definite conclusions can be drawn concerning the case liner bonds.

The fact that some liners show more tackiness than others is a matter of concern.

The test results are not conclusive of early failure for two reasons: (1) adhesive failures and (2) insufficient data.

At a later date, it may be possible to reconcile the apparent differences between lined and unlined cartons by comparing data on an age basis rather than lot basis.

TABLE A-1

COMPARISON OF MEANS AND VARIANCE

Propellant Lots 49 and 50
Very Low Rate Tensile
.0002 in/minute
Strain at Maximum Stress

Carton Lot	N	df	Mean	S^2	Age (Months)	X^2	X^2 Critical (α =.05)	Sig of X^2	F	Sig of F (α =.05)	t	Sig of t (α =.05)
Unlined												
049	15	14	0.1452795	0.000210210	21							
	4	3	0.1323999	0.000041580	22							
050	3	2	0.1327999	0.000085120	21							
Unlined Total	22	21	0.14123631	0.00019086	21-22	2.6822	5.991	N.S.				
									2.985	Sig	3.443	Sig
Lined												
049	3	2	0.1466666	0.00014932	21							
050	3	2	0.1699999	0.0003640	22							
	3	2	0.1946666	0.00003731	23							
Lined Total	9	8	0.17044432	0.00056981	21-23	2.2297	5.991	N.S.				

TABLE A-2

Test Motors

Serial Nr and Batch Nr		Lot	Date of Manufacture
AA21008	M5003000L	052	72159
AA21010	M4965000L	050	72143
AA21015	M4965000L	050	72172
AA21018	M5009000L	049	72199
AA21032	M4936000L	052	72231
AA21053	M4908000L	054	72278
AA21056	M4918000L	053	72285
AA21072	M4966000L	053	72311
AA21082	M4926000L	054	72326

TABLE A-3

LOW RATE TENSILE DATA

Test Date	Age At Test	Lot Nr	Motor S/N	em	Sm	er	Sr	E
74095	022	052	AA21008	0.2161	123.75	0.2790	114.50	861
74095	022	052	AA21008	0.2127	120.71	0.3009	103.67	828
74095	022	052	AA21008	0.2240	119.26	0.3004	105.78	794
74095	023	050	AA21010	0.1939	136.57	0.2756	117.87	1021
74095	023	050	AA21010	0.2134	135.98	0.2957	116.82	909
74095	023	050	AA21010	0.2148	133.73	0.3113	110.27	855
74095	022	050	AA21015	0.2037	141.00	0.2555	127.92	961
74095	022	050	AA21015	0.2096	138.95	0.2589	126.99	957
74095	022	050	AA21015	0.2134	136.70	0.2860	116.68	914
74095	020	052	AA21032	0.2240	125.21	0.2992	111.07	775
74095	020	052	AA21032	0.2266	128.64	0.2907	112.92	824
74095	020	052	AA21032	0.2062	130.95	0.2762	114.7[illegible]	93[illegible]
74095	018	054	AA21053	0.1713	139.21	0.2497	116.02	1186
74095	018	054	AA21053	0.2128	132.08	0.2724	117.34	978
74095	018	054	AA21053	0.1998	136.17	0.2614	119.52	1047
74121	019	053	AA21056	0.2230	128.50	0.2900	120.00	870
74121	019	053	AA21056	0.2190	130.50	0.2720	123.00	875
74121	019	053	AA21056	0.2050	134.50	0.2710	124.00	955
74121	018	053	AA21072	0.1940	125.50	0.2930	111.00	935
74121	018	053	AA21072	0.2280	117.00	0.3040	110.00	790
74121	018	053	AA21072	0.2320	118.50	0.3040	110.00	815
74121	018	053	AA21082	0.1840	142.00	0.2320	135.00	1120
74121	017	054	AA21082	0.1920	137.00	0.2720	125.00	1060
74121	017	054	AA21082	0.1780	142.00	0.2460	133.00	1115

TABLE A-4

VERY LOW RATE TENSILE DATA

Test Date	Age At Test	Lot Nr	Motor S/N	em	Sm	er	Sr	E
74095	022	052	AA21008	0.1680	69.40	0.1720	59.79	494
74095	022	052	AA21008	0.1460	65.52	0.1480	55.96	537
74095	022	052	AA21008	0.1440	67.97	0.1480	57.79	570
74095	023	050	AA21010	0.1960	62.11	0.1980	53.38	377
74095	023	050	AA21010	0.2000	61.98	0.2020	53.13	362
74095	023	050	AA21010	0.1880	65.56	0.1900	56.38	397
74095	022	050	AA21015	0.1800	67.20	0.1820	57.82	419
74095	022	050	AA21015	0.1480	67.78	0.1500	57.86	545
74095	022	050	AA21015	0.1820	67.23	0.1860	57.00	429
74095	021	049	AA21018	0.1600	66.10	0.1620	56.94	491
74095	021	049	AA21018	0.1440	54.71	0.1460	46.69	444
74095	021	049	AA21018	0.1360	66.26	0.1380	56.77	567
74095	020	052	AA21032	0.1880	59.54	0.1900	51.23	369
74095	020	052	AA21032	0.1940	63.38	0.1960	54.55	382
74095	020	052	AA21032	0.2020	61.11	0.2060	51.94	356
74095	018	054	AA21053	0.1740	61.04	0.1780	52.06	366
74095	018	054	AA21053	0.1860	63.07	0.1900	54.17	362
74095	018	054	AA21053	0.1820	64.36	0.1840	55.32	381
74113	018	053	AA21056	0.1660	64.45	0.1700	54.99	440
74113	018	053	AA21056	0.1640	64.24	0.1680	54.50	435
74113	017	054	AA21082	0.1440	61.63	0.1460	52.72	502
74113	018	053	AA21072	0.1740	60.55	0.1780	51.63	399
74113	018	053	AA21072	0.1680	52.58	0.1720	44.42	331
74126	019	053	AA21056	0.1752	66.49	0.1776	63.12	448
74126	018	054	AA21082	0.1520	72.26	0.1536	70.80	511
74126	018	054	AA21082	0.1440	72.00	0.1464	60.54	539
74126	018	053	AA21072	0.1872	61.08	0.1896	50.91	409

TABLE A-5

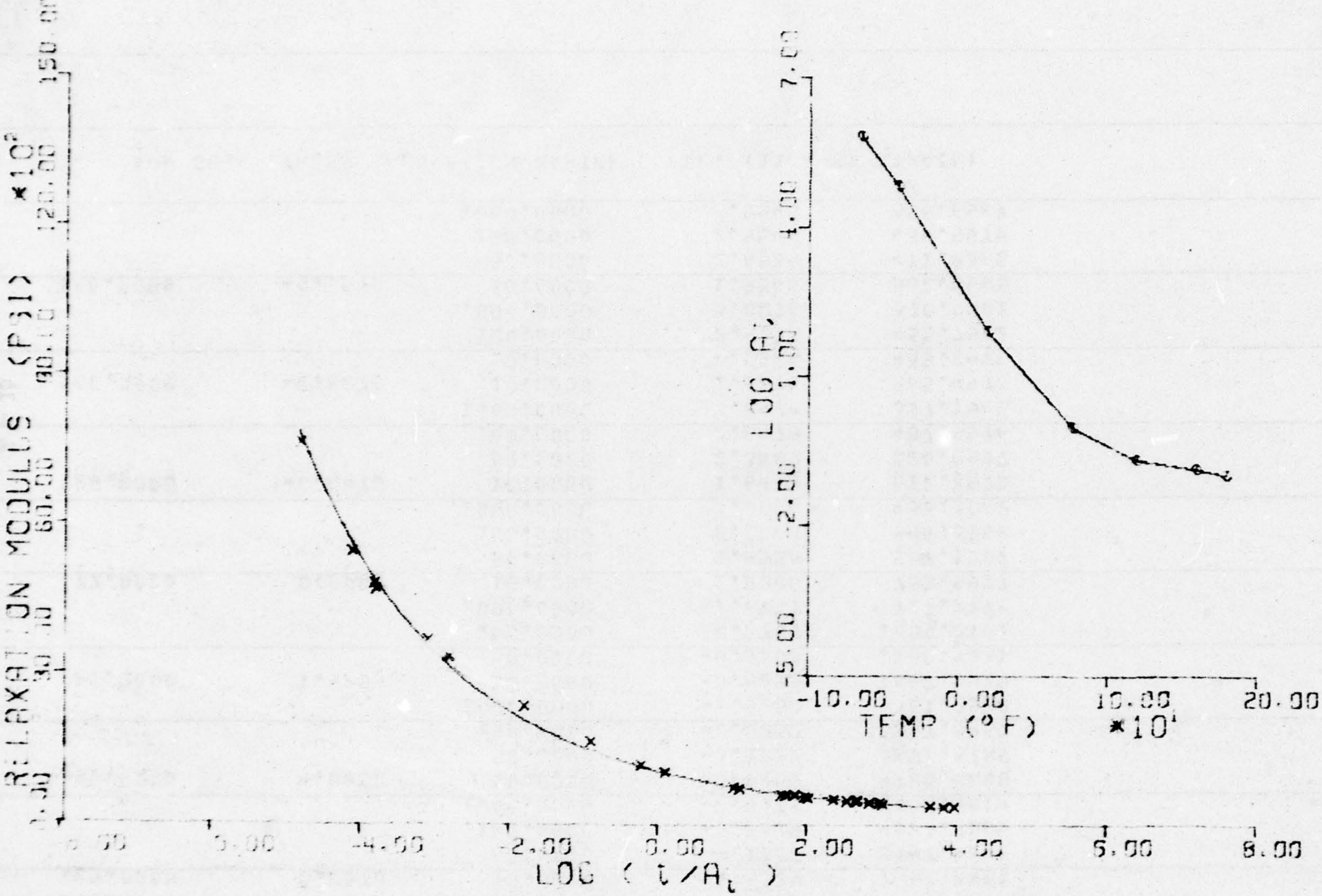
LOW RATE BIAXIAL TENSILE DATA

Test Date	Age At Test	Lot Nr	Motor S/N	em	Sm	er	Sr	E
74107	023	050	AA21010	0.1806	124.35	0.2238	114.13	891
74107	023	050	AA21010	0.1885	118.26	0.1961	116.42	858
74107	023	050	AA21010	0.1801	117.93	0.1978	113.41	880
74107	022	052	AA21008	0.1756	113.14	0.2099	106.19	978
74107	022	052	AA21008	0.1830	114.32	0.2211	104.82	862
74107	022	052	AA21008	0.1696	118.91	0.2128	108.95	1024
74107	022	050	AA21015	0.1735	123.37	0.2103	114.39	927
74107	022	050	AA21015	0.1684	129.60	0.2053	121.40	948
74107	022	050	AA21015	0.1574	125.60	0.1942	116.22	1052
74107	021	049	AA21018	0.1542	116.42	0.1745	108.23	946
74107	021	049	AA21018	0.1597	117.93	0.1711	113.41	941
74107	021	049	AA21018	0.1589	121.66	0.1780	115.18	1040
74107	020	052	AA21032	0.1761	116.55	0.2193	107.18	912
74107	020	052	AA21032	0.1801	115.90	0.2288	106.59	826
74107	020	052	AA21032	0.1848	119.11	0.2166	110.85	889
74107	018	054	AA21053	0.1830	123.83	0.2236	113.14	891
74107	018	054	AA21053	0.1632	129.14	0.2013	118.19	1059
74107	018	054	AA21053	0.1611	128.61	0.1916	122.45	1086
74107	018	053	AA21056	0.1823	118.39	0.2268	[illegible]	[illegible]
74107	018	053	AA21056	0.1878	116.88	0.2323	109.01	854
74107	018	053	AA21056	0.1894	115.63	0.2224	108.75	877
74107	017	053	AA21072	0.1821	112.36	0.2202	104.82	892
74107	017	053	AA21072	0.1702	112.16	0.2020	104.36	849
74107	017	053	AA21072	0.1869	108.23	0.2123	102.72	836
74107	017	054	AA21082	0.1664	125.20	0.1880	120.81	1062
74107	017	054	AA21082	0.1668	129.60	0.2049	119.17	1119
74107	017	054	AA21082	0.1685	131.43	0.1990	124.88	1032

TABLE A-6

HIGH RATE HYDROSTITIC TENSILE DATA

Test Date	Age At Test	Lot Nr	Motor S/N	em	Sm	er	Sr	E
74193	020	054	AA21082	0.2397	515.85	0.2466	509.24	3568
74193	020	054	AA21082	0.2842	484.36	0.2946	472.88	2965
74193	020	054	AA21082	0.2514	524.03	0.2670	511.34	3821
74127	022	049	AA21018	0.2394	436.44	0.3002	416.15	3259
74127	022	049	AA21018	0.2633	455.57	0.2720	447.72	3712
74127	022	049	AA21018	0.2674	422.64	0.2726	416.50	3071
74127	019	053	AA21056	0.2593	427.01	0.2715	416.24	2942
74127	019	053	AA21056	0.2624	441.56	0.2728	432.36	3376
74127	019	053	AA21056	0.2243	425.37	0.2347	413.85	3106
74127	021	052	AA21032	0.2649	457.79	0.2875	439.52	3209
74127	021	052	AA21032	0.2266	443.11	0.2561	432.24	3198
74127	021	052	AA21032	0.2625	443.26	0.2712	433.01	3137
74129	023	050	AA21015	0.2140	504.00	0.2920	462.00	4224
74129	023	050	AA21015	0.2353	444.00	0.2770	424.00	4591
74129	023	050	AA21015	0.2517	450.00	0.2969	425.00	4292
74129	024	050	AA21010	0.2933	451.00	0.3072	429.00	3835
74129	024	050	AA21010	0.2990	443.00	0.3632	404.00	2683
74129	024	050	AA21010	0.2977	428.00	0.3244	399.00	2858
74129	019	054	AA21053	0.2461	444.00	0.2643	418.00	3633
74129	019	054	AA21053	0.2354	422.00	0.2562	400.00	3320
74129	019	054	AA21053	0.2871	437.00	0.3045	415.00	3737
74129	023	052	AA21008	0.2574	419.00	0.2800	389.00	3776
74129	023	052	AA21008	0.2593	445.00	0.3201	402.00	3445
74129	023	052	AA21008	0.2689	449.00	0.3037	416.00	3393
74129	018	053	AA21072	0.2711	350.00	0.2936	325.00	1784
74129	018	053	AA21072	0.2658	418.00	0.3023	391.00	3100
74129	018	053	AA21072	0.2921	400.00	0.3077	381.00	3155



ANB 3066 STRESS RELAXATION MASTER CURVE. (1% & 3% STRAIN)

FIGURE A-1

TEST TEMP	LOG A(T)	TIME	LOG (T/AT)	E(T)
***********	***********	***********	***********	***********
-65.0000	5.8379	10.0000	-4.8379	7664.4551
		50.0000	-4.1389	5447.4648
		100.0000	-3.8379	4823.7305
		1000.0000	-2.8379	3353.4614
-40.0000	4.8252	10.0000	-3.8252	4723.4648
		50.0000	-3.1262	3693.3789
		100.0000	-2.8252	3347.8457
		1000.0000	-1.8252	2361.2588
20.0000	1.9293	10.0000	-0.9293	1662.5029
		50.0000	-0.2303	1188.8931
		100.0000	0.0707	1050.8791
		1000.0000	1.0707	717.2778
77.0000	0.0000	10.0000	1.0000	753.5977
		50.0000	1.6990	587.1982
		100.0000	2.0000	544.3958
		1000.0000	3.0000	435.1982
120.0000	-0.6479	10.0000	1.6479	612.2972
		50.0000	2.3469	520.0977
		100.0000	2.6479	487.6976
		1000.0000	3.6479	397.1985
160.0000	-0.8276	10.0000	1.8276	585.4973
		50.0000	2.5266	489.2979
		100.0000	2.8276	455.7982
		1000.0000	3.8276	370.0981
180.0000	-0.9546	10.0000	1.9546	562.4065
		50.0000	2.6535	471.0365
		100.0000	2.9546	439.5975
		1000.0000	3.9545	358.6987

ANB 3066 STRESS RELAXATION MASTER CURVE, (1% & 3% STRAIN)

TABLE A-7

HARDNESS

Cast/Motor SN	Batch NR	Lot NR	DOM	Test Date	Shore A Initial	Shore A 10 Sec
AA21008	M5003000L	052	72159	74092	73.0	60.0
					72.0	60.0
					72.0	60.0
					72.0	60.0
					72.2	60.0
AA21010	M4965000L	050	72143	74092	76.0	63.0
					74.0	62.0
					75.0	63.0
					74.0	62.0
					74.6	62.0
AA21015	M4965000L	050	72172	74092	76.0	63.0
					76.0	63.0
					77.0	64.0
					76.0	63.0
					75.0	62.0
AA21018	M5009000L	049	72199	74092	74.0	63.0
					[illegible]	[illegible]
					75.0	63.0
					74.0	63.0
					74.4	62.2
AA21032	M4436000L	052	72231	74092	75.0	64.0
					75.0	63.0
					74.0	63.0
					74.0	63.0
					74.4	63.2

TABLE A-7 (cont)

Cast/Motor SN	Batch NR	Lot NR	DOM	Test Date	Shore A Initial	Shore A 10 Sec
AA21053	M4908000L	054	72278	74092	76.0	65.0
					77.0	65.0
					78.0	66.0
					76.0	63.0
					76.4	64.2
AA21056	M4918000L	053	72285	74113	76.0	64.0
					74.0	61.0
					76.0	63.0
					72.0	60.0
					74.[illegible]	62.2
AA21072	M4966000L	053	72311	74113	75.0	63.0
					72.0	60.0
					72.0	59.0
					72.0	60.0
					72.8	60.4
AA21062	M4926000L	054	72326	74114	80.0	68.0
					79.0	68.0
					80.0	68.0
					79.0	68.0
					79.6	68.0

TABLE A-8

TEAR ENERGY

Motor No	CHS	Temp 40	77	120	160
AA21008	.01/.2	1.096	.7281	.3429	.4146
		.7862	.5470	.4002	.5392
		.7382	.5116	.3282	.7410
	.1	.7068	.5687	.2730	.4990
		.6513	.5586	.4922	.6490
		1.016	.6855	.4716	.680
	1.0	1.675	.9330	.8443	.6355
		1.484	.8330	.6972	.8210
		1.536	1.124	.7195	1.070
AA21010	.01/.2	.3801	.4418	.3599	.2956
		.7158	.6218	.3167	.2212
		.4118	.5115	.3232	.3250
	.1/2	.6941	.5906	.6935	.3123
		.9163	.5984	.6732	.2468
		.4768	.4955	.5233	.3675
	1.0/20	1.244	.7199	.8856	.3878
		.7390	1.043	.7767	.4521
		.7674	.7736	.6691	.7330
				.7674	
AA21015	.01/.2	.5074	.4060	.3471	.3130
		.4908	.5002	.2042	.5280
		.5737	.5497	.3066	
	.1/2	.8340	.6026	.5207	.5116
		1.027	.8361	.4319	1.289
		1.024	.3881		.5292
	1/20	1.131	1.073	.8454	1.397
		1.307	.8860	.7361	.9118
		1.403	.9948	.8684	1.352
AA21018	.01/.2	.6171	.3786	.2573	.2154
		.5563	.3579	.2868	.1204
		.7152	.3158	.3369	.1528

TABLE A-8 (cont)

Motor No	CHS	Temp 40	77	120	160
	.1/2	.8072	.5340	.5696	.2019
		.9664	.7117	.4749	.3637
		.9436	.5591	.4507	.3496
	1.0	1.555	.6417	.7647	.9868
		1.184	1.263	.5505	.9813
		1.283	1.049	.9441	1.030
AA21032	.01/.2	.4085	.4040	.2962	.4440
		.5610	.2513	.2003	.2920
		.5994	.4418	.2378	.3220
	.1/2	.6238	.5731	.5098	.4334
		.7321	.7061	.4607	.4903
		.6724	.5183	.2378	.6576
	1/20	1.621	.9256	.3795	.8011
		1.474	.6880	.7246	.8796
		1.237	.6917	.5892	.7207
AA21053	.01/.2	.3212	.9544	.4851	.2188
		.4085	.8078	.5076	.3199
			lost	.4279	.2928
	.1/2	1.832	1.014	.7278	.6639
		.8669	1.159	.5998	.4306
			.9961	.5314	.4256
	1/20	1.899	1.975	1.058	1.057
		2.523	1.983	.8437	.7306
			2.017	1.076	1.359
AA21056	.01	.7505	.8057	.4048	.2159
		.9617	.3291	.5624	.1974
			.5797	.7043	.2226
	.1	1.429	.2821	.9888	.2441
		1.795	1.249	.6612	.3204
			1.370	.6161	.3029
	1.0	2.138	.3366	1.50	.5982
		2.132	.7439	.7802	.4584
		1.221		1.024	.4850

2

TABLE A-8 (cont)

Motor No	CHS	Temp 40	77	120	160
AA21072	.01	.7158	.2059	.5494	.2729
		.4522	.3369	.6086	.2560
		1.694		.4948	.2775
	.1	1.153	.2956	.6032	.6452
		1.427	1.071	.8611	.4383
		1.433	1.223	.4602	.3489
	1.0	2.944	1.271	1.141	.7267
		2.440	.3620	1.108	.7594
		1.873	.5585	1.158	.6026
AA21082	.01	.8925	.6917	.4680	.1945
		.6074	.9664	.5640	.1333
		lost	1.437	.4770	.2403
	.1	1.884	1.238	8456	.5614
		2.206	.9664	5796	.4219
		1.614	.6917	1.027	.4073
				4675	
	1	2.173	1.995	.7611	.8142
		2.268	2.021	.7413	.5493
		2.768	2.097	.8718	.4509

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TABLE A-9

DSC

Motor S/N	Batch/Lot Nr		DOM	Test Date	ENDO	EXO_1	EXO_2	EXO_3	ΔH_1	ΔH_2	ΔH_3
AA21008	M5003	052	72159	74206	516	601	610	639	256	264	135
					513	602	610	64	364	273	358
AA21090	M4947	050	72143	74206	515	593	611	641	162	194	329
				74207	514	597	609	634	406	227	409
					514	598	609	630	162	187	347
AA21015	M4965	050	72172	74207	513	598	609	636	131	166	244
					513	596	608	640	148	230	282
					514	598	609	641	83	201	298
AA21018	M5009	049	72199	74210	515	606	613	639	214	150	379
					516	606	614	641	258	243	259
					514	603	611	638	023	193	201
AA21032	M4936	052	72231	74210	513	601	610	639	355	296	296
					513	603	611	638	184	240	299
					515	602	610	628	141	248	288
AA21053	M4908	054	72278	74211	513	596	609	640	208	228	348
					515	599	610	639	113	210	317
					415	592	609	636	138	209	270
AA21056	M4918	053	72285	74211	513	601	610	641	240	290	255
					516	605	612	635	341	239	283
					514	604	610	632	084	234	267

TABLE A-9 (cont)

Motor S/N	Batch/Lot Nr	DOM	Test Date	ENDO	EXO_1	EXO_2	EXO_3	ΔH_1	ΔH_2	ΔH_3
AA21072	M4966 053	72311	74212	516	605	613	644	137	234	250
				513	603	611	640	262	238	288
				516	605	613	636	110	182	295
AA21082	M4926 054	62326	74213	515	596	607	641	123	193	259
				515	597	611	646	068	186	300
				513	596	609	641	299	223	357

2

TABLE A-10

TCLE

Motor No	Batch No	Lot No	Mfg Date	Test Date	Corrected TCLE Before GP $X10^{-5}\ ^{o}C^{-1}$	Glass Point ^{o}C	Corrected TCLE After GP $X10^{-5}\ ^{o}C^{-1}$
AA21008	M5003	52	72159	74112	6.91	-77	9.11
					6.75	-75	9.50
					7.13	-76	9.18
AA21010	M4947	50	72143		6.45	-78	9.70
					7.09	-77	9.34
					6.51	-77	8.53
AA21015	M4965	50	72172		6.97	-82	8.52
					6.68	-77	8.89
					6.67	-88	9.00
AA21018	M5009	49	72199	74113	6.44	-77	9.51
					6.99	-76	10.1
					6.87	-76	8.64
AA21032	M4936	52	72231	74114	6.51	-80	7.49
					6.30	-80	7.53
					6.43	-77	7.57
AA21053	M4908	54	72278		7.03	-77	9.70
					7.14	-77	9.74
					7.21	-77	9.76
AA21056	M4918	53	72285	74115	6.64	-72	9.02
					5.88	-74	8.55
					6.51	-75	9.12

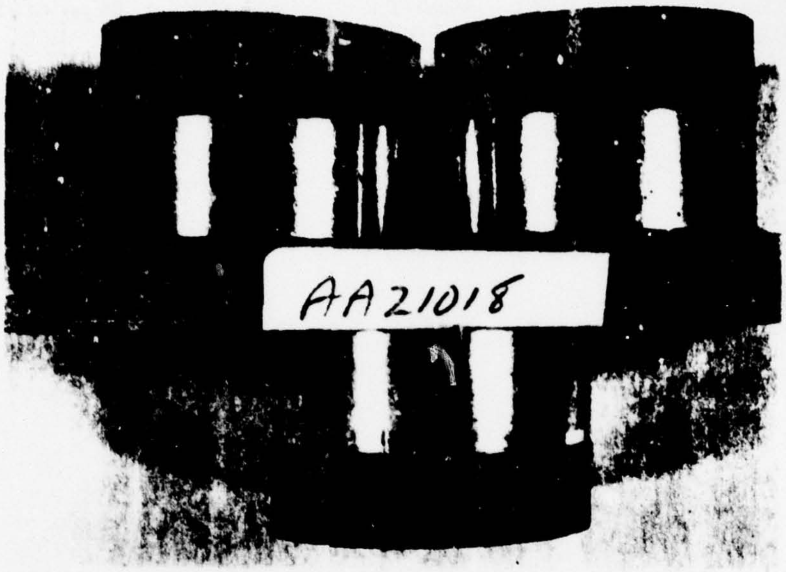
TABLE A-10 (cont)

Motor No	Batch No	Lot No	Mfg Date	Test Date	Corrected TCLE Before GP $X10^{-5}\ {}^{o}C^{-1}$	Class Point ^{o}C	Corrected TCLE After GP $X10^{-5}\ {}^{o}C^{-1}$
AA21072	M4966	53	72311	74115	6.78	-78	8.37
					6.43	-74	7.90
					6.37	-78	8.50
AA21082	M4926	54	72326	74116	5.56	-71	7.22
					6.03	-78	7.36
					5.62	-61	6.64

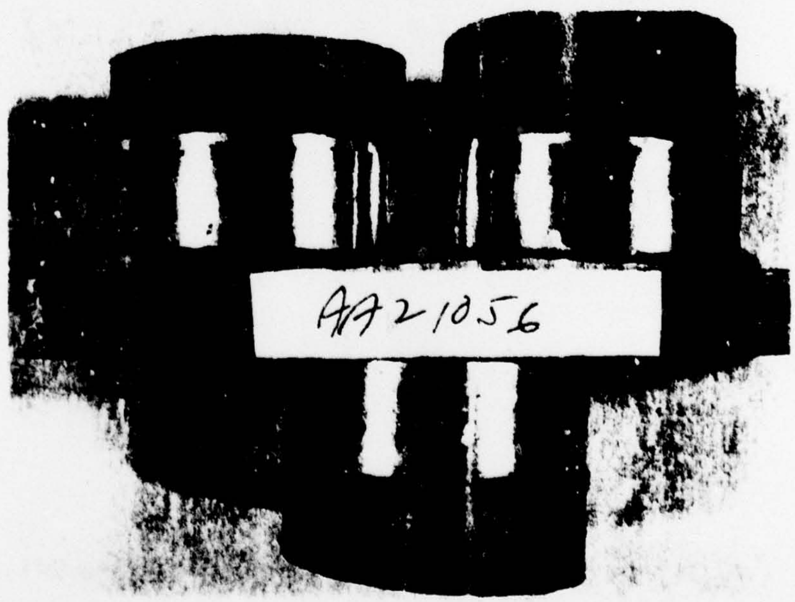
Top shows liner 0.2 in from bond line after milling

Upper specimens show irregular bond line before milling

FIGURE A-2



All specimens show irregular bond line



All specimens show irregular bond line

FIGURE A-3

TABLE A-11

HYDROSTATIC SHEAR

Motor Nr.	Stress	Time-To Failure	P1	P2	Type of Failure % CPP	CPR	L	F
AA21008	144.4	.223 sec			25		75	
	114.8	.144					25	75
AA21010	137.9	.209			70		30	
	107.7	.221			60		40	
	137.1	.159			40		60	
AA21015	58.3	.09					5	95
	82.2	.135			15		20	65
AA21018	119.4	.135			25			75
AA21032	145.5	.169				40	30	30
	32.6	.09						100
AA21053	133.6	.160					98	2
	142.7	.133			15	5	80	
	67.3	.243						100
AA21056	139	.203					85	15
	151.1	.208					90	10
	144.7	.167					100	
AA21072	151.1	.157			40		60	
	107.6	.215			20		80	
AA21082	153.8	.142				25	65	10
	164.4	.179			70		25	5
	124.5	.186			20	20	60	

TABLE A-12

CONSTANT LOAD SHEAR

Carton Nr Lot Nr	Actual Stress psi	Time-To Failure, Min	P1	P2	CPP	CPR	L	F
			Type of Failure %					
AA21008	60.89	.35			50		50	
Lot 052	60.64	.13			95		5	
	41.57	5.7			5		95	
	41.76	3.2	2				98	
	19.99	20190		2			98	
	20.09	900					100	
AA21010	60.64	.075			25		75	
Lot 050	60.89	.067			20		80	
	41.74	4.45			10		90	
	41.57	3.28	1		15		84	
AA21015	60.64	.3			25		75	
Lot 050	60.99	.44			15	1	84	
	42.19	.32			50	1	49	
	41.73	3.75			20	1	79	
AA21018	60.45	.07			80		20	
Lot 049	60.16	.27						100
	41.83	.13						95
	41.92	.77			90		10	
	19.89	2490			20		80	
	19.96	627			50		50	
AA21032	60.64	.12			40		60	
Lot 052	60.89	.13			60		40	
	41.76	1.87	3		35		62	
	42.14	1.6	2		40		53	
AA21053	60.64	.05			30		70	
Lot 054	60.89	.08			10		90	
	42.19	.7			20		80	
	41.73	.5			10		90	
AA21056	60.89	.23			80		20	
Lot 050	60.64	.06			90		10	
	41.57	1.4			70		30	
	41.76	0.03			30			70
	18.65	2189			20		80	
	18.69	2949			30		70	
AA21072	60.89	0.1			95		5	
Lot 053	60.64	.25			98		2	
	41.57	2.88			95		5	
	41.76	5.07			80		20	
	19.99	2430			60		40	
	20.09	18600 Discontinued						

TABLE A-12 (cont)

CONSTANT LOAD SHEAR

Carton Nr Lot Nr	Actual Stress psi	Time-To Failure, Min	Type of Failure % P1	P2	CPP	CPR	L	F
AA21082	60.64	.14	1		80		19	
Lot 054	60.89	.11			90	1	9	
	41.76	.14	1		95	1	3	
	41.57	2.1	1		85		14	

TABLE A-13

CONSTANT LOAD TENSILE

Carton Nr Lot Nr	Actual Stress, psi	Time-To Failure, Min	Type of Failure % P1	P2	CPP	CPR	L	F
AA21010	59.73	56			15		85	
Lot 050	59.91	94	5		50		45	
	41.11	4613			20		80	
	41.19	1759			25		75	
AA21015	59.73	1.4			100			
Lot 050	59.91	2.7			45		55	
	41.16	1349			80		20	
	41.19	72.4			95		5	
AA21018	59.73	.68	2		78		20	
Lot 049	59.91	.22			75	2	23	
	41.28	6.1			80		20	
	41.54	12.8			30		70	
AA21032	59.73	.77	5		40		55	
Lot 052	59.91	1.4			60		40	
	41.25	19.7	2		58		40	
	41.35	10.5			75		25	
AA21053	59.73	.05			20	20	60	
Lot 054	59.91	.08		10	40		50	
	41.25	4.4			20	10	70	
	41.35	13.7		10	20		70	
AA21056	60.45	7.8			95		5	
Lot 053	60.16	1.75			95	2	3	
	41.83	207			60		40	
	41.92	1			5			95
AA21072	60.45	1.5			99		1	
Lot 053	60.16	.03						100
	41.83	906			95		5	
	41.92	972		20				80
	19.89	10254 Discontinued						
	19.96	10254 Discontinued						
AA21082	59.73	1.6			60		40	
Lot 054	59.91	4.8			40		60	
	41.28	169	5		40		55	
	41.54	81	5		70		25	

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13. ABSTRACT

This report contains test results on Stage II, LGM-30 F and G, ANB-3066 propellant from unlined cartons and nine lined cartons. Data were compared to previous MANCP data to determine the effects of aging on ANB-3066. Testing was accomplished under MMEMP Project 4MP-054P.

Unlined carton data for a specific parameter was consolidated into a single linear regression analysis. "Worst lots" described in Section III, were used in regression analysis of three tests.

One lot with average tensile properties was subjected to further testing to determine other properties of the propellant.

Lined carton data are presented in Appendix A.

Statistically significant trends are not of sufficient magnitude to cause failure in twenty-four months.

KEY WORDS: Solid Propellant
Minuteman

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